

**A REVIEW OF CERTAIN
ASPECTS OF THE SLOT
ALLOCATION PROCESS AT
LEVEL 3 AIRPORTS UNDER
REGULATION 95/93**

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Preface

The objective of this report is to contribute to the EU Commission's ongoing review of Council Regulation (EEC) No. 95/93, as amended, on "common rules for the allocation of slots at Community airports".

The report was commissioned by ACI EUROPE as an independent study to be performed by this author. It was agreed contractually that the views and conclusions presented in the report would be clearly identified as those of the author alone and that they might not necessarily agree with or reflect those of ACI EUROPE.

The report's scope is limited by the fact that it is an individual effort conducted with limited resources. There is no intent to replicate broader-scope team studies of the Regulation and its impacts, such as the study carried out for the Commission in 2011 by the consultancy of Steer Davies Gleave (*"Impact Assessment of Revisions to Regulation 95/93"*) or another one by the same consultancy, which is currently in progress. Instead, the focus is on a small number of topics that ACI EUROPE identified as being of interest, to which I have added a couple that are of special interest to me personally and have been the subject of extensive academic research over the past few years. After presenting in Chapter 1 a general perspective on the subject of slot allocation at Level 3 airports where Regulation 95/93 is applied, I have devoted short sections to each of these topics in Chapters 2 and 3, summarizing the background and issues involved and offering, where appropriate, suggestions or recommendations concerning potential amendments to the Regulation. The focus is on amendments (or changes to aspects of the allocation process) that could be adopted in the short term. This has precluded consideration of so-called "market-based mechanisms" (e.g., congestion pricing, slot auctions), with the only exception being secondary trading – which is discussed in the report. Nonetheless, it is my personal view that, as numerous prominent academic and industry experts have argued over the past 50 years, market mechanisms, particularly the application of some forms of congestion pricing, deserve serious consideration for inclusion among the instruments to be used in the longer term.

In addition to its role in identifying topics to be addressed, ACI EUROPE provided critical support for the collection of data from coordinators and selected airports – a task that proved occasionally difficult and time-consuming. Indeed, one of the lessons I drew from this exercise is that access to such data is very much in the public interest and should be facilitated. The relevant information for every Level 3 airport already resides, in processed form, with the responsible coordinators. This information does not contain sensitive data and should not be treated as being of a privileged nature.

Finally, I note that, as the application in practice of Regulation 95/93 draws heavily on the *Worldwide Slot Guidelines* (WSG) that are published by IATA, I have also referred extensively to these guidelines in this report, using the 9th Edition of the WSG that was issued in January 2019.¹

* * *

There are many people whose assistance I would like to acknowledge, while noting that they may not share the views expressed in this report and that I am solely to blame for any errors contained herein.

- Aidan Flanagan (ACI EUROPE), Morgan Foulkes (ACI EUROPE) and Gunter Heinrich (Fraport AG) for critical help in understanding several issues pertaining to Regulation 95/93, assistance with the collection of some of my data, comments on two drafts of my report, and never trying to influence my conclusions.
- Dr. Christina Milioti (National Technical University of Athens) and Alexander Roeland Papen (MIT) for assistance in processing some of the data and for useful comments and suggestions.

¹ Shortly after a full draft of this report had been completed (September 2019), I learned that IATA had issued a new version of the WSG, effective August 1, 2019. This latest (10th) Edition has been prepared by a Task Force consisting of airline representatives, coordinators and, for the first time ever, airport representatives. It contains at least two important changes to the 9th Edition. Although the general spirit and direction of the changes is consistent with recommendations that had already been made in this report, it was still necessary to update the report in order to recognize the changes and comment on them. This was done by means of a small number of brief *addenda* (three in Chapter 1, four in Chapter 2 and two in Chapter 3). These addenda are clearly identified as such in the report.

- Fred Andreas Wister (Past Chairman, EUACA and ACN – Norway Coordination) and Ignacio Monasterio (AECFA – Spain Coordination) for assistance with obtaining data, many helpful comments and a very useful teleconference.
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Chapter 1: Context, History and General Observations

1.1 The Context

§1.1. Airports offering commercial passenger service are subdivided into three classes according to the level of congestion they experience. Those “where the capacities of all infrastructure at the airport are generally adequate to meet the demands of users at all times” are classified as “Level 1”; those “where there is potential for congestion during some periods of the day, week, or season which can be resolved by schedule adjustments mutually agreed between the airlines and a facilitator” as “Level 2” (or “facilitated”); and those where “it is necessary for all airlines and other aircraft operators to *have a slot allocated by a coordinator in order to arrive or depart at the airport* during the periods when slot allocation occurs” [*italics added*] as “Level 3” (or “coordinated” or “schedule coordinated”) [IATA 2019]. In colloquial terms, the three levels correspond, respectively, to “uncongested”, “mildly congested”, and “seriously congested”.

§1.2. The focus of this report is on certain aspects of the process and on some of the rules through which slots are currently allocated to airlines at Level 3 airports in the EU under Council Regulation (EEC) 95/93 on “common rules for the allocation of slots at Community airports” (henceforth referred to as “Regulation 95/93” or “the Regulation”). **In addition to the EU Member States, Regulation 95/93 is applied to Level 3 airports in the European Economic Area (Iceland, Liechtenstein, Norway) and in Switzerland, a total of 32 States.** Ongoing developments make this the right time to consider this topic with a sense of urgency, as Level 3 airports are playing an increasingly central role in European and global air transport and as the slot allocation process itself has generated much recent discussion and has been the subject of significant and continuing controversy over the years.

The European Commission is currently re-examining Proposal COM(2011) 827 of 1/12/2011 (henceforth the “2011 Proposal”) [European Commission 2011] for amending Regulation 95/93 – a proposal that has not been acted on to date. The re-examination comes against the dual backdrop of (i) growing scarcity of slots, especially during peak demand periods, at an increasing number of Level 3 airports

and (ii) alleged inefficiencies in the use of the limited existing capacity of these airports. The persistently high growth rates of European air traffic over the current decade (as measured by number of passengers and, to a lesser extent, by number of aircraft movements) have also led to significant increases in air traffic delays in many parts of Europe during the summer seasons of 2018 and 2019, a development that has underscored the urgency of the airport capacity problem within the EU and through much of the continent.

At a global level, the Economic Commission of the International Civil Aviation Organization (ICAO) noted during ICAO's 39th Assembly in Fall 2016 "the need to optimize the use of scarce capacity, particularly at capacity constrained airports" [ICAO, 2016]. In response, the International Air Transport Association (IATA) and Airports Council International (ACI) agreed to review jointly this topic "and report progress to the next session of the Assembly" in Fall 2019. Airport coordinators are also participating in this ongoing "Strategic Review", whose initial phase is scheduled to be concluded by the end of 2019.

In addition, airport coordination and the allocation of airport slots have continued to be the subject of extensive research and writings in academic publications, books and professional journals² and have received significant recent attention even in the popular press and, especially, in industry publications.

§1.3. The scope of this report is narrow, given its limited resources and objectives. It will seek to address only a small subset of the numerous tactical and strategic issues that will probably be considered during the ongoing review of the Regulation.

² The volume of academic research and writings – mostly by economists – on airport demand management and slot allocation is truly enormous, with the first publications dating back to the 1960s. Most of this research (including several seminal contributions) focuses on economic ("market-based") instruments for allocating scarce airport capacity. On the specific issue of slots and their allocation, a volume edited by Czerny et al (2008) contains a fine compendium of papers, some of which also offer valuable historical perspectives. Starkie (2008) also provides original and interesting perspectives on the subject. A review paper by Gillen et al (2016) presents an update, including an operations research viewpoint. Examples (out of many) of recent papers with novel insights include Adler and Yazhensky (2018) on the value of marginal changes in the capacity of congested airports, Fukui (2019a) on the impact of slot restrictions on airfares, and Fukui (2019b) on slot hoarding.

This introductory chapter will summarize the background and context for the specific issues to be discussed in Chapters 2 and 3. It will: present traffic data that demonstrate the critical role that Level 3 airports now play in air transport throughout the world and, especially, in Europe and the EU; review briefly the history of the existing regulatory framework that guides slot allocation at the Level 3 airports where the Regulation applies; offer some general observations and note several concerns about this framework and about current practices in applying it; and identify the specific questions on which the remainder of the report will concentrate, as well as the objectives of the related analysis.

1.2 The Critical Role of Level 3 Airports

§1.4. Table 1.1 shows the number of airports designated as Level 3 in the five regions of the world (as defined by IATA³) for the five most recent scheduling seasons, beginning with the summer season⁴ of 2017 (S17) and ending with S19. These roughly 200 airports represent only about 6% of the more than 3000 airports around the globe where commercial airline service is offered. But despite their relatively small number, Level 3 airports are of immense importance to the global air transport system, as they include the great majority of the busiest airports in the world⁵, outside the United States⁶. They served close to 3.2 billion arriving and departing passengers in 2017 – or, **about 40% of the total number of the world’s airport passengers and more than 55% of all airport passengers outside the United States.**

³ See IATA, Worldwide Slot Guidelines, Annex 11.6.

⁴ A “Summer season” consists of the 30- or 31-week period that begins on the last Sunday of March and ends on the Saturday before the last Sunday of October.

⁵ Of the 30 busiest airports in the world outside the United States, 29 were designated as Level 3 in S18, with the sole exception being Jakarta’s Soekarno-Hatta Airport, which was designated as Level 2.

⁶ To minimize the extent of schedule coordination at its airports, the United States has traditionally refrained from designating airports as Level 3. Many airports in the US are severely congested today. Yet, only New York’s JFK International Airport is currently designated as Level 3.

Region	S17	W17/18	S18	W18/19	S19
Asia Pacific	37	37	37	39	38
Europe	103	75	104	78	104
Middle East and Africa	10	13	13	15	16
North Asia	13	23	23	23	23
Americas (only JFK in USA)	14	13	27	25	23
Total	177	161	204	180	204

Table 1.1: Number of Level 3 airports worldwide in recent summer (S) and winter (W) seasons.

§1.5. The role of Level 3 airports is even more critical in the EU and in Europe. As shown in Table 1.1, about half of all Level 3 airports in the world during summer seasons are in Europe. Of the 25 busiest airports in Europe in 2018, 24 were designated as Level 3⁷. Similarly, within the 32 States where Regulation 95/93 is in force, 24 of the busiest 25 (all but Athens) were Level 3, including all the major international air hubs that connect these States with the rest of the world. Indeed, of the 104 Level 3 airports in Europe in S19, the great majority (89) was in the EU and another eight in Iceland (1), Norway (5) and Switzerland (2). This reflects the chronic difficulty that many European nations have – as a result of physical infrastructure constraints and/or limited air traffic management capabilities and/or environmental considerations – in increasing the capacity of their airports.

Table 1.2 is based on traffic data from 585 commercial airports in the EU, Iceland, Liechtenstein, Norway, and Switzerland. It shows that the 97 Level 3 airports mentioned above handled more than 76% of all arriving and departing passengers in these 32 States in 2017 and in 2018!

⁷ Moscow's Domodedovo, a Level 2 airport, was the sole exception.

	Passengers (million)		Commercial Passenger Air Traffic Movements (thousand)	
	Total	Level 3	Total	Level 3
2017	1,783	1,366 (76.6%)	14,683	10,256 (69.8%)
2018	1,880	1,437 (76.4%)	15,212	10,714 (70.4%)

Table 1.2: EU States plus Iceland, Liechtenstein, Norway and Switzerland: Total traffic at all airports vs. traffic at Level 3 airports only. [Source of traffic data: ACI, *World Airport Traffic Dataset*, 2019 edition.]

They also served about 70% of all aircraft movements⁸ (arrivals and departures). It follows that **public perceptions about the performance of the entire air transport system in the 32 States are largely shaped by the performance of Level 3 airports.**

Table 1.3 compares traffic levels in 2018 and 2010 at 95 of the 97 airports⁹ in the 32 States that were designated as Level 3 in S19. For each airport, Table 1.3 shows the number of (i) passengers (PAX), (ii) air traffic movements that carried commercial passengers (ATMP), and (iii) average number of passengers per air traffic movement carrying commercial passengers (PAX/ATMP) in each of the two years, along with the (positive or negative) percent change for each. The year 2010 was selected advisedly as the “baseline” for these comparisons. First, 2010 was the first year of traffic recovery in Europe, following the economic recession, and marked the beginning of one of the longest sustained periods of strong air transport growth in Europe and the world. Second, the 2007-2010 period was the time when most of the data were collected for the long Steer Davies Gleave (2011) report (*Impact Assessment of Revisions to Regulation 95/93*) that served as one of the main sources

⁸ The difference in Table 1.2 between the share of passengers vs. the share of movements served at Level 3 airports (76% vs. 70% in 2018) indicates that the average number of passengers per movement at Level 3 airports is larger than the average number of passengers per movement at Level 1 and 2 airports. This is partly due to a greater presence of wide body aircraft at many Level 3 airports, placing an additional strain on both runway and terminal building capacities.

⁹ Missing are the airports of Lampedusa and Pantelleria in Italy that constitute special cases and handle minuscule levels of traffic.

	AIRPORT	CODE	2010			2018			CHANGE (2018 VS. 2010)		
			(1) ATMP (10 ³)	(2) PAX (10 ⁶)	(3) PAX/ATMP	(4) ATMP (10 ³)	(5) PAX (10 ⁶)	(6) PAX/ATMP	(7) ATMP (%)	(8) PAX (%)	(9) PAX/ATMP (%)
1	LONDON	LHR	446.7	65.9	147.5	472.7	80.1	169.5	5.8	21.6	14.9
2	PARIS	CDG	458.0	58.2	127.0	450.5	72.2	160.3	-1.6	24.2	26.2
3	AMSTERDAM	AMS	370.7	45.2	122.0	483.5	71.1	147.0	30.4	57.2	20.5
4	FRANKFURT	FRA	434.8	53.0	121.9	479.3	69.5	145.0	10.3	31.1	18.9
5	MADRID	MAD	432.4	49.8	115.3	382.0	57.9	151.5	-11.7	16.1	31.4
6	BARCELONA	BCN	275.0	29.2	106.2	317.6	50.1	157.9	15.5	71.8	48.7
7	LONDON	LGW	233.5	31.4	134.4	283.9	46.4	163.5	21.6	48.0	21.7
8	MUNICH	MUC	364.2	34.7	95.3	388.4	46.3	119.1	6.7	33.2	24.9
9	ROME	FCO	319.9	36.2	113.2	303.6	43.0	141.6	-5.1	18.7	25.0
10	PARIS	ORY	215.5	25.2	116.9	229.0	33.1	144.6	6.3	31.4	23.7
11	DUBLIN	DUB	147.2	18.4	125.0	218.3	31.5	144.3	48.3	71.1	15.4
12	ZURICH	ZRH	227.4	22.8	100.4	244.1	31.1	127.4	7.3	36.3	27.0
13	COPENHAGEN	CPH	235.3	21.5	91.2	252.0	30.3	120.1	7.1	41.1	31.7
14	PALMA DE M.	PMI	172.7	21.1	122.2	202.7	29.1	143.4	17.4	37.7	17.4
15	LISBON	LIS	135.3	14.1	103.9	209.7	29.0	138.4	55.0	106.4	33.2
16	MANCHESTER	MAN	147.3	17.9	121.3	191.7	28.4	148.0	30.1	58.6	21.9
17	OSLO	OSL	203.3	19.1	93.9	243.1	28.3	116.4	19.6	48.3	24.0
18	LONDON	STN	133.2	18.6	139.5	175.6	28.0	159.4	31.9	50.7	14.3
19	VIENNA	VIE	238.1	19.7	82.7	234.7	27.0	115.2	-1.4	37.3	39.3
20	STOCKHOLM	ARN	178.3	17.0	95.3	230.2	26.9	116.9	29.2	58.4	22.6
21	BRUSSELS	BRU	194.5	17.1	88.1	202.7	25.6	126.5	4.2	49.5	43.5
22	MILAN	MXP	181.9	18.9	104.2	189.9	24.7	130.1	4.4	30.4	25.0
23	DÜSSELDORF	DUS	203.2	19.0	93.4	206.5	24.3	117.6	1.6	27.9	25.8
24.	BERLIN	TXL	152.1	15.0	98.8	180.5	22.0	121.9	18.6	46.4	23.4

	AIRPORT	CODE	2010			2018			CHANGE (2018 VS. 2010)		
			(1) ATMP (10 ³)	(2) PAX (10 ⁶)	(3) PAX/ATMP	(4) ATMP (10 ³)	(5) PAX (10 ⁶)	(6) PAX/ATMP	(7) ATMP (%)	(8) PAX (%)	(9) PAX/ATMP (%)
25	HELSINKI	HEL	169.0	12.9	76.1	183.3	20.8	113.7	8.4	62.0	49.4
26	MALAGA	AGP	100.7	12.0	119.6	129.3	19.0	146.9	28.4	57.6	22.8
27	WARSAW	WAW	116.7	8.7	74.7	172.5	17.8	103.0	47.8	103.9	37.9
28	GENEVA	GVA	121.5	11.8	96.9	143.3	17.6	123.2	17.9	49.8	27.1
29	HAMBURG	HAM	137.4	13.0	94.3	135.9	17.2	126.8	-1.1	32.9	34.4
30	PRAGUE	PRG	152.8	11.5	75.5	136.7	16.8	122.8	-10.5	45.6	62.7
31	LONDON	LTN	69.6	8.7	125.7	105.1	16.8	159.6	51.0	91.8	27.0
32	ALICANTE	ALC	73.3	9.4	127.9	93.4	14.0	149.5	27.5	49.0	16.8
33	NICE	NCE	145.3	9.6	66.1	163.0	13.9	85.0	12.2	44.2	28.6
34	GRAN CAN'A	LPA	97.5	9.5	97.2	119.5	13.6	113.5	22.6	43.0	16.7
35	BIRM'NGHM	BHX	84.9	8.6	101.1	106.6	12.9	120.8	25.7	50.2	19.5
36	MILAN	BGY	57.1	7.7	134.5	88.1	12.8	145.6	54.5	67.2	8.2
37	BERLIN	SXF	66.3	7.3	110.1	89.6	12.7	142.1	35.1	74.4	29.0
38	PORTO	OPO	52.6	5.3	100.4	87.6	11.9	136.3	66.7	126.1	35.7
39	STUTTGART	STR	103.9	9.2	88.8	108.4	11.8	109.0	4.4	28.2	22.8
40	VENICE	VCE	67.2	6.9	102.0	86.5	11.2	129.2	28.7	63.0	26.7
41	LYON	LYS	112.4	8.0	71.0	105.8	11.0	104.3	-5.9	38.3	47.0
42	TENERIFE	TFS	49.1	7.3	148.8	64.9	11.0	169.5	32.3	50.7	13.9
43	NAPLES	NAP	55.4	5.6	100.9	71.6	9.9	138.6	29.4	77.9	37.5
44	CATANIA	CTA	54.3	6.3	116.4	70.4	9.9	141.0	29.7	57.1	21.2
45	KEFLAVIK	KEF	21.5	1.8	83.4	62.2	9.8	157.7	189.5	447.4	89.1
46	MILAN	LIN	90.7	8.3	91.5	94.0	9.2	97.8	3.7	10.8	6.8
47	BRISTOL	BRS	52.8	5.7	108.8	65.1	8.7	133.7	23.1	51.3	22.9
48.	FARO	FAO	39.2	5.3	136.1	55.8	8.7	155.7	42.1	62.6	14.4

	AIRPORT	CODE	2010			2018			CHANGE (2018 VS. 2010)		
			(1) ATMP (10^3)	(2) PAX (10^6)	(3) PAX/ATMP	(4) ATMP (10^3)	(5) PAX (10^6)	(6) PAX/ATMP	(7) ATMP (%)	(8) PAX (%)	(9) PAX/ATMP (%)
49	HERAKLION	HER	40.8	4.9	120.5	56.4	8.1	143.7	38.1	64.7	19.2
50	IBIZA	IBZ	51.5	5.0	97.7	62.6	8.1	129.4	21.5	60.9	32.5
51	VALENCIA	VLC	63.8	4.9	77.3	60.4	7.8	128.4	-5.4	57.2	66.2
52	LANZAROTE	ACE	44.5	4.9	110.9	57.4	7.3	127.6	28.9	48.4	15.1
53	GOTHENBURG	GOT	55.6	4.2	75.1	63.9	6.8	106.9	14.9	63.6	42.3
54	THESS'NIKI	SKG	42.0	4.0	95.8	53.5	6.7	125.0	27.4	66.2	30.5
55	PALERMO	PMO	44.1	4.4	98.9	48.3	6.6	137.2	9.5	51.8	38.7
56	HANOVER	HAJ	56.3	5.1	89.9	53.7	6.3	117.8	-4.6	25.0	31.0
57	BERGEN	BGO	69.4	5.1	73.2	69.3	6.3	90.4	-0.1	23.3	23.5
58	EINDHOVEN	EIN	18.6	2.1	114.9	36.7	6.2	168.6	96.7	188.6	46.7
59	FUERTEV'RA	FUE	37.9	4.2	110.1	49.1	6.1	124.3	29.6	46.4	13.0
60	ROME	CIA	30.7	4.5	147.4	33.5	5.8	173.6	8.9	28.3	17.8
61	RHODES	RHO	30.6	3.6	117.2	37.5	5.5	147.0	22.5	53.6	25.4
62	BILBAO	BIO	47.2	3.9	82.2	46.3	5.5	117.7	-1.9	40.5	43.2
63	LONDON	LCY	59.9	2.8	46.4	75.3	4.8	63.8	25.6	72.5	37.3
64	TRONDHEIM	TRD	47.7	3.5	73.9	50.7	4.4	87.0	6.3	25.1	17.7
65	CAGLIARI	CAG	31.6	3.4	108.9	29.9	4.4	146.1	-5.3	27.0	34.1
66	STAVANGER	SVG	46.9	3.7	78.3	43.9	4.2	96.5	-6.6	15.1	23.2
67	TURIN	TRN	43.3	3.6	82.1	37.5	4.1	108.6	-13.2	14.8	32.2
68	BILLUND	BLL	35.4	2.6	72.7	37.8	3.5	92.8	6.8	36.2	27.5

	AIRPORT	CODE	2010			2018			CHANGE (2018 VS. 2010)		
			(1) ATMP (10^3)	(2) PAX (10^6)	(3) PAX/ATMP	(4) ATMP (10^3)	(5) PAX (10^6)	(6) PAX/ATMP	(7) ATMP (%)	(8) PAX (%)	(9) PAX/ATMP (%)
69	MENORCA	MAH	27.2	2.5	92.2	28.9	3.4	119.1	6.0	37.1	29.3
70	KERKYRA	CFU	14.3	1.7	122.0	24.6	3.3	135.9	72.2	91.9	11.4
71	TREVISO	TFS	20.6	1.8	86.4	19.5	3.3	169.1	-5.1	85.8	95.8
72	FUNCHAL	FNC	21.6	2.2	103.5	23.5	3.2	135.2	9.0	42.4	30.7
73	OLBIA	OLB	16.3	1.6	99.5	23.0	3.0	129.2	41.2	83.3	29.9
74	CHANIA	CHQ	13.4	1.7	123.4	19.2	3.0	155.0	43.1	79.7	25.6
75	FLORENCE	FLR	24.2	1.7	71.2	27.6	2.7	98.0	13.9	56.9	37.8
76	KOS	KGS	14.1	1.6	115.1	20.0	2.6	131.3	41.4	61.3	14.1
77	STOCKHOLM	BMA	41.3	2.1	50.2	47.1	2.5	53.1	14.0	20.6	5.8
78	POZNAN	POZ	16.6	1.4	85.3	20.2	2.5	122.8	21.1	74.5	44.0
79	TROMSOE	TOS	28.3	1.6	58.2	34.7	2.3	66.9	22.5	40.9	15.0
80	SANTORINI	JTR	7.8	0.7	93.2	19.0	2.2	117.0	144.5	207.0	25.6
81	ROTTERDAM	RTM	12.9	1.0	77.5	15.6	1.9	124.2	21.3	94.3	60.2
82	ZAKYNTHOS	ZTH	6.7	0.9	129.8	12.9	1.8	139.1	91.5	105.3	7.2
83	GENOA	GOA	16.6	1.3	76.8	15.0	1.5	97.3	-9.7	14.4	26.6
84	MIKONOS	JMK	5.5	0.4	78.4	13.9	1.4	98.5	151.9	216.4	25.6
85	KEFALLINIA	EFL	3.9	0.4	91.7	6.7	0.7	111.5	72.4	109.8	21.7
86	PREVEZA	PVK	2.7	0.3	108.9	5.1	0.6	112.0	89.9	95.3	2.8
87	SKIATHOS	JSI	2.3	0.2	101.6	3.9	0.4	108.3	71.5	82.7	6.5
88	KALAMATA	KLX	1.6	0.1	60.9	2.6	0.3	108.4	64.9	193.6	78.1

	AIRPORT	CODE	2010			2018			CHANGE (2018 VS. 2010)		
			(1) ATMP (10 ³)	(2) PAX (10 ⁶)	(3) PAX/ATMP	(4) ATMP (10 ³)	(5) PAX (10 ⁶)	(6) PAX/ATMP	(7) ATMP (%)	(8) PAX (%)	(9) PAX/ATMP (%)
89	KARPATOS	AOK	3.3	0.2	48.0	3.6	0.2	69.1	7.2	54.4	44.1
90	CHIOS	JKH	5.0	0.3	53.2	5.5	0.2	41.9	9.4	-13.9	-21.3
91	PAROS	PAS	1.8	0.03	18.6	3.7	0.2	55.2	104.5	505.8	196.2
92	PATRAS	GPA	0.9	0.1	88.2	1.4	0.2	133.5	51.9	130.0	51.4
93	SITIA	JSH	1.8	0.04	21.7	1.3	0.1	48.2	-28.3	59.3	122.4
94	VOLOS	VOL	0.6	0.1	98.1	0.4	0.04	92.4	-19.4	-24.1	-5.8
95	KITHIRA	KIT	0.7	0.02	32.5	1.0	0.04	38.5	40.6	66.5	18.4
TOTAL			9,401.6	995.8	106	10,714.0	1,437.1	134	14.0	44.3	26.6

Table 1.3: Traffic in 2010 and 2018 at all Level 3 airports in the 32 States in Europe where Regulation 95/93 is in force; airports are listed in the order of their number of passengers (PAX) in 2018; PAX= commercial passengers; ATMP = air traffic movements carrying commercial passengers. [Source of data: ACI, *World Airport Traffic Dataset*, 2019 edition.]

Notes:

1. Our data for Greek airports in 2010 and 2018 and for Spanish and Polish airports in 2010 do not distinguish between movements that carry commercial passengers (including “combi” movements) and movements that are all-cargo. The ATMP counts shown for these airports (and these years) may therefore include some all-cargo movements. The number of passengers per passenger-carrying movement (PAX/ATMP) for these airports may therefore be underestimated. However, the error should be small in most of these cases, as the overall number of all-cargo movements accounts for less than 2% of all commercial air traffic movements.
2. Data for Treviso (row 71) were obtained from assaeroporti.it; the number of movements shown is for all types of movements and may include all-cargo, general aviation and business aviation flights.
3. The Level 3 airports of Lampedusa and Pantelleria in Italy are missing from the data; the airports serve extremely small levels of commercial traffic.

	ATMP (thousand)	PAX (million)	PAX/ATMP	ATMT (thousand)
2010	9,402	996	106	10,443
2018	10,714	1437	134	11,786
Change	+14.0%	+44.3%	+26.6%	+12.9%
AAGR	+1.6%	+4.7%	+3.0%	+1.5%

Table 1.4: Overall summary statistics and comparisons for the 95 Level 3 airports listed in Table 1.3; ATMT = total air traffic movements, AAGR = average annual growth rate.

for the preparation of the Commission’s 2011 Proposal. Thus, comparisons with 2010 offer an indication of the extent to which conditions have changed since the 2011 Proposal was submitted.

Table 1.4 presents aggregate comparisons between 2010 and 2018 for the 95 Level 3 airports of Table 1.3. The most striking feature is the 44.3% increase in the number of passengers in only 8 years – an average annual growth rate (AAGR) of 4.7%. However, the number of air traffic movements that carried these passengers (ATMP) increased by only 14%, or 1.6% per year on average. Had the ATMPs increased as quickly as the number of passengers (PAX), the consequences would have been catastrophic as the runway capacities of most of the busiest of these airports would have been totally inadequate for handling such levels of air traffic, with the net result being some combination of a very large number of rejected slot requests and/or of unacceptably long delays. Indeed, even the 14% growth between 2010 and 2018 outpaced the increases in declared capacity of the runway systems of many of the busiest Level 3 airports (Sections 3.3 and 3.6), thus resulting in growing scarcity of slots at several of them.

The difference between the growth rates of the numbers of PAX and ATMPs is explained by the 26.6% increase, from 106 to 134, in the average number of passengers per movement. This increase is consistent with a global pattern and is due to three concurrent trends: (i) new aircraft models – that are slowly replacing older ones – have, on average, a larger seating capacity than the models they are replacing; (ii) tighter seating arrangements in the cabin; and (iii) increasing load factors, now approaching the 85% level, that have resulted from the development of

advanced reservation systems and from the “capacity discipline” that airlines have exercised in recent years.

Finally, Table 1.4 also indicates that the total number of air traffic movements, ATMT (i.e., ATMP plus any cargo/mail, general aviation, business aviation and military movements) typically exceeds ATMP by about 1 million movements annually at the Level 3 airports of Table 1.3, with large variations from airport to airport in the number of non-ATMP movements (e.g., LHR had only about 2000 such movements in 2018, while ZRH had about 34,000).

The changes in Level 3 airport demand between 2010 and 2018 have had major consequences for airports. Most obviously, the close to 50% increase in the number of passengers has led to severe overcrowding in parts of many terminal buildings during peak travel hours. Airport operators have been forced to invest heavily in expensive re-modeling of passenger terminals and, in some cases, in the construction of new ones. At the same time, the capacity of runway systems (the “bottleneck” most resistant to capacity increases) is now stretched to its limits at several airports (Section 3.3).

Looking to the future, increases in the number of passengers per commercial movement (PAX/ATMP) may not be able to absorb as much of the growth in the number of passengers as in the recent past. The first of the three trends (new aircraft with more seats replacing older ones) that led to the increases in PAX/ATMP will almost certainly continue. But the other two are likely to abate: given such realities of air travel as strong seasonality, load factors cannot increase much further; and ever-tighter seating arrangements may also be reaching their limits. Growth rates for air traffic movements may therefore start “tracking” more closely the growth rates for passengers, thus placing more pressure on runway systems. According to the most recent version of the periodic EUROCONTROL forecasts [*European Aviation in 2040: Challenges of Growth* (EUROCONTROL, 2018)] air traffic delays at the principal European airports can be expected to become even more severe and widespread over the next 20+ years, with 16 airports (up from 6 currently) experiencing “Heathrow-like congestion” by 2040, under the most likely scenarios for the future. Should such predictions materialize, **the number of major airports designated as**

Level 3 may then increase further, as will the number of airports which could be considered “super-congested” (Section 3.3). If anything, Level 3 (and “Level 4”?) airports may then play an even more dominant role in Europe’s air transport sector.

§1.6. It is equally important, for the purposes of this report, to note that **the Level 3 airports of Table 1.3 constitute a highly non-homogeneous set. Some of the key problems associated with the current slot allocation system stem from this diversity in the characteristics of these airports.**

In terms of size, the airports in Table 1.3 span an enormous range, from 80.1 million passengers in 2018 (London Heathrow) to fewer than 50 thousand (an average of fewer than 150 passengers per day) in the case of a couple of Level 3 airports in Greece. At one end of the spectrum, all members of the group of the 9 busiest airports, each serving more than 40 million annual passengers as of 2018, ranked among the top 50 in the world¹⁰. Some of these are also among the most advanced operationally airports in the world and include four of the five global hubs in Europe¹¹. At the opposite end, 33 – or about one-third – of the airports in Table 1.3 served fewer than 5 million passengers in 2018, with 11, all in Greece, serving fewer than 1 million. Most of the airports in this second group are highly seasonal. In many cases, their Level 3 designation is due to inadequate infrastructure (airfield and/or terminals) and/or to a variety of other (not necessarily technical) problems that make it difficult to handle even modest volumes of traffic during seasonal peaks¹².

The Level 3 airports of Table 1.3 also experience widely diverse levels of congestion. A number of them have hardly any slots left and are operating at their (declared) capacity limits during most of the useful hours of the day. Included in this category are several airports that play a critical role in terms of providing

¹⁰ Remarkably, these nine airports served 37% of all passengers at the 95 Level 3 airports listed in Table 1.3.

¹¹ The fifth global European hub is the new airport of Istanbul.

¹² However, in some of these cases (e.g., certain island locations) there would be no point in adding airport infrastructure to accommodate more flights and passengers, because the overall local infrastructure (hotels, services, etc.) would be insufficient to support additional airport passenger traffic.

connectivity within Europe and between Europe and the rest of the world. By contrast, a number of other Level 3 airports still have a quite large number of “free” slots available, even during some of the peak hours of the day, and thus still have room to accommodate many more flights and carriers in the future. A third, more “typical” group has few available slots during the peak hours of the day, but a significant number at most other times.

1.3 Regulatory Framework: Brief History

§1.7. The allocation of airport slots at Level 3 EU airports is performed in accordance with Regulation (EEC) 95/93, as amended by Regulations (EC) 894/2002, (EC) 1554/2003, and, especially, (EC) 793/2004¹³. Through Communication COM(2008) 227, the Commission has clarified certain parts of Regulation 95/93 concerning such items as the independence of coordinators, new entrant carriers, transparency, local guidelines, and secondary trading. Finally, as already noted, the Commission has proposed a number of important amendments to Regulation 95/93 in its 2011 Proposal. This latter proposal has not been acted on to date.

§1.8. IATA’s *Worldwide Slot Guidelines* (henceforth WSG) have played a central role in the development and application of Regulation 95/93. It is therefore useful to review briefly the history of these guidelines. IATA’s Scheduling Conferences, now taking place twice a year, started in 1947 (IATA, 2000), leading to the development of the WSG. The latest version of the guidelines (IATA 2019) was published in January 2019 as the ninth edition of the WSG, with the first edition having been published in 2010. Previously, IATA issued its guidelines under the title *Worldwide Scheduling Guidelines*, with the first edition published in 2000 and the last (nineteenth) in 2010. A comparison of the first edition (in 2000) of the *Worldwide Scheduling Guidelines* with the latest edition (2019) of the WSG shows that the fundamental principles on which the slot allocation process has relied have remained virtually unchanged. Differences between the two editions are mainly editorial (recent editions are better structured and far more detailed with respect to

¹³ References to “Regulation 95/93” will henceforth denote the current version of the Regulation that includes its amendments over time.

describing the process and its administrative procedures) while substantive changes are few and of mostly limited practical consequence¹⁴. Moreover, the WSG's fundamental principles and rules date to well before 2000. According to the preface to the most recent version (9th Edition) of the WSG (IATA, 2019), "the standards contained in this document [the WSG] have been developed since 1974". Kilian (2008) sets the origins of these standards to an even earlier date, citing the publication of an IATA *Scheduling Procedure Guide* (SPG) in 1967.

Finally, it is noteworthy that **before 2019 airport representatives were not involved in the preparation of the WSG**. As the preface to the 8th Edition of the WSG stated, "The standards contained in this document have been developed since 1974 and are the result of consultation between *airlines and airport coordinators and facilitators*" (IATA 2017, *italics added*). For the first time ever, airport representatives participated in the preparation of the 2019 version of the WSG ["...result of consultation between airlines, airport coordinators and facilitators *and the airport managing bodies*" (IATA 2019, *italics added*)]. Partly as a result, some significant changes to the WSG may be introduced soon.

Addendum 1.1: Shortly after a full draft of this report was completed, a copy of the 10th edition ("effective August 1, 2019") of the WSG (IATA 2019b), issued in mid-year, became available to this author. As anticipated in the last sentence of §1.8 above, this new edition, prepared for the first time with participation by airport representatives, contains two important changes to the WSG and several less significant ones, including some extensive edits of the text. Both of the major changes are consistent (in terms of direction of change) with the recommendations made in this report – but more modest. They will be summarized in Addendum 1.3 and

¹⁴ For instance, the minimum required length of a requested slot series was 4 in the 2000 version and is 5 in the latest version. Possibly the most important of the changes from the practical viewpoint is one, first introduced in 2007, that weakens the "use-it-or-lose-it" rule concerning slot series that enjoy historic preference (see Section 2.3) and another in the latest (January 2019) edition that moves the "Series Return Deadline" to a month earlier (see Section 2.3.3) for the W19/20 and S20 seasons.

discussed in more detail in addenda to Sections 2.3 and 3.1. Some of the less significant changes will also be discussed in an addendum to Section 2.3.

§1.9. IATA's procedures, set of rules, criteria and priorities for slot allocation served as the basis for the original version of Regulation 95/93 of January 18, 1993 (Bauer, 2008). Even after all the subsequent amendments (with the latest one in 2004) **the framework set forth by Regulation 95/93 is very similar for most practical purposes to the one described by the WSG.** The most significant difference between Regulation 95/93 and the WSG is the definition of a "new entrant carrier"¹⁵ that appears in Article 2(b) of Regulation 95/93¹⁶. Other differences are of relatively minor practical consequence and concern such points, as the conditions for re-timing historic slots, code-shared flights, and additional criteria for slot allocation.

Addendum 1.2: The two important changes contained in the August 2019 version of the WSG (IATA 2019b) (see Addendum 1.1) obviously constitute two additional points on which Regulation 95/93 now differs from the WSG.

§1.10. Importantly, the WSG is far more detailed than Regulation 95/93, providing easy-to-follow slot allocation guidelines with a complete timeline and relatively few gaps. **The WSG thus serves in practice as the *de facto* reference document for the slot allocation process at Level 3 airports in the States where the Regulation applies,** with the exception of the few aforementioned instances where it may be in conflict with the Regulation. Regulation 95/93 implicitly endorses this practice by stating (Article 8, paragraph 5) that *"the coordinator shall also take into*

¹⁵ The definition of new entrant is more "liberal" in Regulation 95/93 than in the WSG, as the former includes provisions that reward carriers for offering flights to regional airports within the EU and for serving underserved pairs of Community airports (see Section 3.2 for a detailed discussion). As a result, some carriers (specifically airlines that qualify as Community carriers) may be able to obtain a significantly larger number of slots at EU Level 3 airports under Regulation 95/93 than under the WSG.

¹⁶ The text of Article 2(b) resulted from an amendment introduced by Regulation 793/2004: cases 2(b)(ii) and 2(b)(iii) that appear in Article 2(b) of the Regulation are not included in the definition of "new entrant" in the WSG. The WSG limits "new entrants" to solely case 2(b)(i) of the Regulation.

account additional rules and guidelines established by the air transport industry worldwide or Community-wide” – a clear reference to the WSG.

1.4 Two General Observations

§1.11. It follows from this background that the ongoing review of Regulation 95/93 should be informed by two general observations:

(a) The core principles of the slot allocation process have remained largely unchanged for decades, despite the momentous changes that have taken place in the air transport sector worldwide and in Europe and the EU during that time.

(b) The issues that must be addressed at Level 3 airports have become increasingly diverse over the years.

§1.12. *Core Principles vs. Changes in the Sector:* The core principles and practices of the slot allocation process can be summarized as follows:

- (1) A single set of allocation principles and rules is applied at all coordinated airports throughout the world** through a universal process that relies on a timeline of milestones and events that is repeated twice a year for the Winter and Summer “seasons”.
- (2) The process relies on purely administrative decision-making mechanisms,** with no economic (“market-based”) considerations playing a role in the allocation of scarce capacity. The only instance in which an economic instrument (monetary transaction) may be used to acquire a slot is in connection with secondary trading, i.e., *after* the initial slot allocation has been made (Section 3.2)¹⁷.
- (3) A coordinator is responsible for the allocation of slots and for monitoring and enforcing compliance with the Regulation.** Coordinators are appointed (in the EU) by the Member State responsible for each Level 3 airport, must be “**functionally independent**” from any interested party, and must act “in a neutral, non-discriminatory and transparent way” (Regulation 95/93, Article 5).

¹⁷ Among EU Member States, secondary trading is currently officially sanctioned only in the United Kingdom.

- (4) **The process places primary emphasis on encouraging and maintaining the continuity of service by individual airlines** at coordinated (Level 3) airports. “Grandfather rights” (“historic precedence”) are granted to incumbent carriers for each series of “historic” slots; these rights can be exercised in perpetuity from season to season, as long as the utilization of the slots in the series exceeds a specified threshold (currently 80%) during the previous equivalent season.
- (5) Carriers may request changes to the timing and/or purposing (e.g., market served, type of aircraft used) of each of their historic slot series; coordinators will endeavor to accommodate such changes, subject to slot availability, and will **accord such requests for changes priority over requests for slot series by new entrant carriers and over any other requests for new slot series** (i.e., for any slot series that do not have grandfather rights).
- (6) **Carriers that qualify for designation as “new entrant” may obtain up to 50% of the pool of slots that remain *after* incumbent carriers have received their historic slots and *after any requested changes* have been made to historic slots** – see (5) above.
- (7) **To be designated as “new entrant” a carrier must satisfy certain conditions that limit severely the number of slots a carrier may obtain in a new entrant capacity** (see Section 3.1).

With the exception of Item (3) above, which reflects the great importance that Regulation 95/93 associates with the impartiality and independence of coordinators, all of the above core principles precede the 1993 deregulation/liberalization of the European Community’s air transport system (and Regulation 95/93)¹⁸. **However, several of the momentous changes that have taken place since the time these principles were first adopted have important implications for the task of allocating capacity at congested airports.** Obvious examples would include: the deregulation of the airline industry in most of the developed world and the attendant emphasis on removal of barriers to competition; the privatization of most major

¹⁸ These principles may even precede the United States Airline Deregulation Act of 1978, the first ever deregulation of a major air transport system. I have been unable to locate a copy of IATA’s *Scheduling Procedure Guide* from the 1970s.

airlines and the virtual disappearance of the notion of the state-owned “flag” carrier; the emergence of the concept of “Community carrier” in the EU, with all such carriers enjoying, in principle, the right of equal access to air transport markets throughout the EU; the emergence and rapid growth of low-cost carriers in the EU (and in much of the world) with many of these carriers seeking to expand aggressively into more markets; and the extensive adoption – with the EU in the forefront – of multilateral “open skies” agreements through much of the world. Yet, **the slot allocation principles and process have remained largely unchanged in the face of all these developments.**

Addendum 1.3: As noted in Addendum 1.3, the 10th edition of the WSG (effective August 1, 2019) contains two important changes. The first of these affects core principle (5) [in the list of (1) – (7) in §1.12]. According to the latest version of the WSG, requests by new entrants will essentially now enjoy *equal* priority with requests for changes to historic slots, as well as with requests for new slots by non-new-entrants. Addendum 3.2 in Section 3.1 will discuss this change in some detail. Regulation 95/93 maintains, at least for now, the priorities indicated under core principle (5) of §1.12 above.

The second important change increases the maximum number of slots that a new entrant can obtain to “fewer than 7” (i.e., to a maximum of 6) from the previous limit of “fewer than 5”. It thus has some impact on core principle (7) in the list of §1.12 above, in the sense that the limit on the number of slots has been increased by one slot rotation per day. Regulation 95/93 continues, at least for now, to use the “fewer than 5” limit in the relevant part [Article 2(b)(i)] of the Regulation.

§1.13. *Increasingly Diverse Issues at Level 3 Airports:* The enormous diversity – with respect to size, congestion and slot availability – of the nearly 100 Level 3 airports currently coordinated under Regulation 95/93 has already been noted in §1.6. For example, a growing number of very important airports in Europe (as well as throughout the world) have become almost completely “saturated” because of infrastructure limitations or environmental constraints, so that there are simply no more slots to be allocated there. Such “super-congested” airports present a challenge

that was not anticipated when Regulation 95/93 was adopted. The issue to be addressed in such cases is not what slots and how many to allocate to new requests, but how to: maintain a competitive environment in the absence of slot mobility; achieve at least a modicum of turnover in markets served; avoid slot “gridlock”; and, more generally, maximize the contribution of the airport to social welfare. Other areas where priorities may differ across Level 3 airports include: improving connectivity; incentivizing investments in new capacity; attracting new entrants or other carriers that would develop a “critical mass” of flight offerings at the airport (and possibly counter-balance a dominant carrier); maintaining adequate service on domestic routes; minimizing the environmental “footprint” of the airport; and, ensuring service resilience in cases where a major incumbent airline withdraws, for whatever reason, from the airport.

Regulation 95/93 does not have sufficient flexibility and breadth to address this diverse spectrum of issues and needs. In its current form (and by analogy to the WSG) the Regulation adopts a “one-size-fits-all” stance and calls for applying the same process and set of rules to a large set of Level 3 airports, which, in truth, face many different types of problems that may call for different solutions in each case.

§1.14. The observations in §1.12 and §1.13 point to fundamental problems that are among the root causes of some of the most commonly voiced criticisms of the slot allocation process, as practiced today. They indicate the need for a careful review of the Regulation with the objectives of: **(i) updating it so it is better aligned with and more responsive to the realities of today’s air transport environment;** and **(ii) expanding its scope and perspectives so it is able to address the broader spectrum of issues that currently arise at different Level 3 airports.**

1.5 Outline and Objectives

§1.15. As noted at the outset, the scope of this report is limited to a small subset of the numerous tactical/procedural and strategic/policy issues concerning the Regulation. Given the background presented in this chapter, the following specific topics will be reviewed briefly in Chapters 2 and 3:

1. Growing complexity of the slot allocation process and the negative implications of this complexity.
2. Utilization of valuable airport capacity and potential measures for reducing apparent waste, as reflected in the number of slots that are allocated before a season and eventually go unused.
3. Treatment of new entrants by the Regulation and possible steps to improve their access to Level 3 airports and to strengthen their presence there.
4. Advantages and disadvantages of secondary trading and the related issue of “slot ownership”.
5. Growing number of “super-congested” airports and the possibility of designating such airports as a special (“Level 4”?) class that would be coordinated under a special set of allocation principles and rules.
6. Need for special provisions for slot allocation in instances where large blocks of slots become available all at once, as a result of capacity expansion or other reasons.
7. Improving the transparency of the slot allocation process and facilitating access to relevant information.
8. Setting the declared capacity of Level 3 airports.

The overall objective is to accomplish some of the following, as appropriate to each topic:

- Provide relevant background and summarize aspects of the Regulation or of current practice that have come under some criticism in the past.
- Summarize mitigation options and the problems/issues they would address.
- Identify parts of the Regulation that may warrant amendment ranging from simple clarification of specific points to significant revision.
- Examine whether the Commission’s 2011 Proposal addresses some of the identified problems and issues.
- Offer recommendations or suggestions, if appropriate, regarding the way forward.

Topics 1 and 2 refer to “tactical” aspects of how the process currently works and the potential relevant remedies mostly involve modifications to current

procedures and practices. They are addressed in Chapter 2 of the report. Topics 3 through 8 refer to more “strategic” issues and to questions of policy and are covered in Chapter 3. Chapter 4 provides a summary of the report’s contents, conclusions and recommendations.

Chapter 2: Tactical and Technical Issues

2.1 Complexity of the Slot Allocation Process and Its Consequences

§2.1. The Slot Allocation Process (SAP) at Level 3 airports in the EU and elsewhere has become increasingly complex, technically and substantively, over the years. As in the past, the SAP must consider several types of requests for slots by the airlines and comply with a set of priorities assigned to these slots, as well as with a demanding set of “schedule regularity” constraints. But the strong overall growth in demand for air travel has also led to the following four developments that have greatly contributed to the SAP’s complexity:

- (i) An ever-expanding list of coordination parameters.
- (ii) Severe scarcity of “good” slots at many of the most important airports.
- (iii) Growing diversity of Level 3 airports (see also Chapter 1) in terms of size, level of congestion and types of issues faced.
- (iv) Need to consider a lengthening list of “additional criteria” for slot allocation.

This section presents a brief review of these developments and concurrently provides a short description of the main current rules of the SAP, as background for the topics to be discussed in this and the next chapter. At the end of the section two fundamental negative consequences of increased SAP complexity are summarized.

§2.2. *Coordination parameters*¹⁹: The growing demand, in terms of both aircraft movements on the airfield and passengers in terminal buildings, has forced many airport operators to increase the number and complexity of coordination parameters, i.e., of the capacity limits they declare for the various elements of Level 3 airports.

Until the early 2000s, declared capacities at the great majority of airports took the simple form of a limit on the total number of aircraft movements (landings and takeoffs) that could be scheduled per hour (e.g., “a maximum of 40 movements per

¹⁹ §2.2 and §2.3 are based on a recent paper by Ribeiro et al (2019b), which provides a quite detailed description of the slot allocation process, as performed today.

Declared Capacity Indicators	Lisbon Airport 2014	Lisbon Airport 2015								
		00:00 06:59	07:00 08:59	09:00 09:59	10:00 13:59	14:00 14:59	15:00 17:59	18:00 19:59	20:00 20:59	21:00 23:59
Flight Movements / hour	38	38	40	34	38	39	38	40	34	38
Arrivals and Departures / hour	26	26	26	23	26	26	26	26	23	26
Flight Movements / 15 min	12	12	12	10	12	12	12	12	10	12
Arrivals and Departures / 15 min	10	10	10	9	10	10	10	10	9	10
Flight Movements / 30 min	21									
Arrivals and Departures / 30 min	19									
Flight Movements / 180 min	113									
Arrivals and Departures / 180 min	77									
Terminal 1 Arrivals / hour	Schengen Non- Schengen	2500 1500				2500 2000				
Terminal 1 Departures / hour	Schengen Non- Schengen	2300 1500				2300 1500				
Terminal 2 Departures / hour	Schengen Non- Schengen	600 300				600 450				
Apron / Nr. aircraft		63				63				

Table 2.1: Declared capacities for Lisbon Airport in S14 and S15. [Source: Ribeiro et al (2019b).]

hour” or, in some cases, “a maximum of 40 total movements per hour, of 24 arrivals per hour and of 28 departures per hour”). However, a fast-growing number of airports now employ much finer granularity, with the objective of maintaining relatively even demand schedules throughout the day, avoiding short-term overloads and ensuring that traffic loads (movements, passengers, bags, etc.) in each of the individual elements of the airport are manageable. As an example, Table 2.1 (Ribeiro et al., 2019b) shows the declared capacities of Lisbon Airport (LIS) in S14 and S15. Note, first, that separate capacities are specified for the runway system, the apron and each of the two terminals of the airport. Second, runway capacities are specified for each of four different time intervals in 2014 (15, 30, 60 and 180 minutes) and for each of two different time intervals in 2015 (15 and 60 minutes). Third, the declared capacities are further broken down into limits on total number of movements, number of landings and number of takeoffs for the runways, and into limits on the number of arriving, departing, Schengen, and non-Schengen passengers for the terminal buildings. Moreover, the runway limits at LIS are treated as *5-minute rolling horizon limits*. For instance, for 2014, no more than 38 total movements, no more than 26 arrivals and no more than 26 departures could be scheduled between 10:00

and 11:00, between 10:05 and 11:05, between 10:10 and 11:10, etc., no more than 12, 10 and 10, respectively, between 10:00 and 10:15, between 10:05 and 10:20, etc., and similarly for the 30-minute and 180-minute limits. Note that by 2015 the runway limits at LIS varied by time-of-day, as well, e.g., “up to 40 movements between 8:00 and 9:00, up to 34 movements between 9:00 and 10:00, etc.”.

Extensive sets of coordination parameters, similar to those in Table 2.1, **have by now become the rule, rather than the exception, at the principal (and also at some secondary) Level 3 airports**. The slot allocation process may therefore have to contend with such complications as: **consideration of limits specified for time intervals of several different lengths** (e.g., of 15, 30 and 60 minutes); **capacities applied over rolling time windows**; and **constraints that apply to different elements of the airport** (e.g., runways, apron, terminals) and are **expressed in terms of different units** (i.e., limits on the number of movements or of aircraft or of various types of passengers).

§2.3. *Slot Requests and Schedule Regularity Constraints*: Slot requests for a season are submitted by airlines to slot coordinators about six months before the season begins (e.g., in early October for the next Summer season, which begins in late March). Submissions are in the form of requests for *slot series*. A slot series consists of “*at least five slots having been requested for the same time on the same day of the week regularly in the same scheduling period*” [Article 2(k), Regulation 95/93]. In most cases, a series includes a request for a slot pair (or “slot rotation”), i.e., for an arrival slot and a subsequent departure slot²⁰. A typical example is a request for “an arrival slot at 11:50 and a departure slot at 13:00 on every one of the 17 Mondays between May 1 and August 31 in S19” – a total of 34 slots (17 slot rotations) in this case.

The allocation of slot times to a series is guided by two fundamental *schedule regularity* constraints:

²⁰ However, requests may also be submitted solely for a series of arrivals or solely for a series of departures.

- i) All slots belonging to the same series must be allocated to the same time of the day²¹.
- ii) Identical series of slots requested by an airline for different days of the week should be given, if possible, slots at the same time of the day across the different days of the week²².

If, as is usually the case, a request involves a slot pair (i.e., for the arrival and departure of the same aircraft), an additional scheduling constraint requires that the requested time interval between the arrival and departure slots be maintained (or, at worst, adjusted with minimal changes) when the slot pair is allocated to avoid interfering with airline planned on-ground times and dilution of the connectivity of an airline's schedule of flights²³.

The schedule regularity constraints, as will be explained in more detail later, **increase greatly the computational difficulty of finding good solutions to the problem of allocating slots over an entire season, as all the days of a season must be considered and scheduled simultaneously** (instead of scheduling each day separately).

The notion of a slot's *displacement* is critical to the task of assessing the quality of any set of slot allocations. The displacement of an allocated slot (or of an allocated slot series) is defined as the absolute value of the difference between the time that an airline had requested for that slot (or slot series) and the time actually

²¹ Article 2(k) actually states “... to the same time of the day or, if that is not possible, at approximately the same time”. IATA's WSG uses exactly the same wording. In practice, allocation to the *exact* same time is typically enforced.

²² For example, if an airline has requested “an arrival slot at 11:50 and a departure slot at 13:00 on every **Monday** between May 1 and August 31 in S19” and, for the same flight number, “an arrival slot at 11:50 and a departure slot at 13:00 on every **Tuesday** between May 1 and August 31 in S19”, the coordinator will allocate the same slot times to the Monday series and the Tuesday series, if possible. This schedule regularity constraint is also typically treated in practice as a requirement.

²³ For instance, if the airline-requested times for the arrival and the departure of the aircraft were 11:50 and 13:00, respectively, then the slot times allocated by the coordinator to this request should differ by 70 minutes (e.g., 12:15 and 13:25).

assigned by the coordinator to that slot (or slot series)²⁴. Clearly, **one of the most important objectives of coordinators is to find “efficient” slot allocation solutions that comply as closely as possible with airline-requested slot times, i.e., allocations with low overall levels of displacement.**

§2.4. *Priorities of Slot Requests*: Slots must be allocated in accordance with a set of priorities specified in Regulation 95/93²⁵. Specifically, requests for slot series are classified into four categories: *unchanged historic* (abbreviated as ‘H’ henceforth), i.e., requests for series that enjoy historic precedence and for which no changes from the previous equivalent season have been requested; *change-to-historic* (‘CH’), i.e., requests that include a requested change to a series that enjoys historic precedence; *new entrant* (‘NE’), i.e., requests from airlines that qualify for designation as NEs because they previously held no slots or a small number of slots at the airport in question (see Section 3.1 for details); and *“other”* (‘O’), i.e., requests by non-new-entrant carriers for slots additional to the ones they already hold. Top priority is accorded to H requests, which retain the same series of slots as in the previous equivalent season on the basis of historic precedence (“*grandfathering*”) as long as they have satisfied the “use-it-or-lose-it” rule in the previous equivalent season. The rule requires that the utilization rate of the series exceed a specified threshold, which is currently set at 80%. Second priority is accorded to CH requests. If the coordinator cannot accommodate a requested change for a CH series, the series is assigned back to its historic slot time or to a slot time other than the one requested, if that time is acceptable to the airline.

After slots have been allocated to the H and CH slot series, the remaining free slots, if any, constitute the **slot pool** that will be allocated to the NE and O slot series.

²⁴ For instance, if the requested time for a slot is 20:00 and the time assigned by the coordinator is 19:30, the displacement is equal to 30 minutes. In formal notation, slot displacement is defined as the absolute difference, $|t_r - t_a|$, between t_r and t_a , which represent, respectively, the requested and allocated slot times. In some slot allocation contexts, it may also be important to distinguish between cases in which the quantity $(t_r - t_a)$ is positive or negative.

²⁵ These priorities are identical with those specified in the WSG (IATA, 2019).

NE requests must be allocated 50% of the slots in the pool, unless the total number of slots requested by NEs is less than that 50%. Finally, after the allocation of slots to NEs, the slots remaining in the pool are allocated to the O requests and, if there are any slots still left, to any NE requests that could not be accommodated at the previous step. At the end of this initial step in the slot allocation process, either all the slot requests will have been accommodated (albeit not necessarily all at the same slot times requested by the airlines) or some requests will either have been rejected outright, because the total demand for slots exceeded the airport's declared capacity, or have been placed in a waiting list²⁶ for potential future allocation. Series in this waiting list may be considered again later in the allocation process, after some allocated series or individual slots have been returned or cancelled (see Section 2.2).

Addendum 2.1: As previously noted (Addendum 1.1) the August 2019 version of the WSG (IATA 2019b) includes an important change in these priorities that will become effective starting with the W20/21 season. Unchanged H slot requests (i.e., series with historic precedence for which no change has been requested or for which the change requested does not affect the coordination parameters) will still enjoy top priority and retain their historic slot times. However, CH, NE and O slots will be assigned equal priority, subject to the condition that CH requests shall retain their historic slot times, if the requested change of time cannot be accommodated. 50% of the slots in the slot pool must still be allocated to NE requests, unless NE requests are fewer than that 50%. In the context of this section, this change will, if anything, further increase (i) the computational difficulty of finding good solutions to the problem of allocating slots over a season, and (ii) the complexity of the decision-making process when it comes to determining the recipients of slots for which more than one requests qualify. Regulation 95/93 continues, at least for now, to adopt the priorities indicated in §2.4 above.

²⁶ These are called "no-slot waitlists". Many coordinators also maintain a waiting list for slot requests that have already been assigned slot times, but are waiting for re-assignment should a more desirable slot time become available later in the process.

§2.5. *Additional Criteria*: To complicate things further, “**additional criteria**” have been added over the years to the list of considerations that go into decisions concerning slot allocation. The emergence of these additional criteria is a reflection of the growing diversity of Level 3 airports and attendant issues noted in Chapter 1. Regulation 95/93 does not identify explicitly any such criteria, but instructs coordinators [Article 8(5)] to “*also take into account additional rules and guidelines established by the air transport industry world-wide²⁷ or Community-wide as well as local guidelines proposed by the coordination committee and approved by the Member State*”. The WSG does indeed provide a list of such criteria [Paragraph 8.4 of IATA (2019)] and allows for the possibility of more of them being specified locally.

Additional criteria are typically stated as guidelines that may be used for “tie-breaking” purposes, i.e., in cases when two or more slot series are equally eligible, according to the primary criteria described in §2.3 above, for allocation to a particular slot time. But, in practice, they serve a larger purpose as they may **reflect the growing need to address questions specific to individual airports** that may differ greatly from each other with respect to size, nature of capacity constraints, role in local, national and regional economies, connectivity needs, prevailing competitive conditions, etc.

An example of the variety and breadth of such criteria is the following excerpt from the “*Guideline for the allocation of scarce slots at coordinated German Airports*” issued by FLUKO, the agency responsible for slot coordination and facilitation in Germany (FLUKO, 2011):

“4.12. During the allocation procedure, a comparison shall be made of the requested traffic from applicants of equal status with regard to the best possible utilisation of the scarce airport capacity. In this connection, the following aspects shall be taken into consideration:

*- best possible **utilisation of scarce resources** by daily services in comparison to non daily services, type and availability of the aircraft, additional routes offered by*

²⁷ This is clearly a reference to the WSG.

the new inclusion of a region or country, optimal mixture of long-haul, medium-haul and short-haul routes to preserve or improve the hub function;

*- **service quality** of the planned service (direct or connecting services, membership in an airline alliance);*

*- **user-friendliness** (creation of possibilities of choice among several airlines in certain individual markets, accessibility of transport services for consumers, optimisation of a route in heavy demand e.g. as a connection to a region or capital, balanced range of charter and scheduled services for holiday and business travellers, while taking account of the requirements of freight transport);*

*- paying attention to **fair competition** by opening opportunities for new interested parties to enter the market for a certain service (new regional connection, heavy demand etc.), taking already existing services, their load factor and operation into consideration, fair implementation of restrictions through new official or legal requirements;*

*- taking **environmental concerns** into account (arrival and departure times, size of the aircraft employed, noise and pollutant emissions);*

*- **safeguarding public transport interests** (significance of the service for the national and European location, for the competitive situation in individual markets, for the consolidation of the airlines operating in the market).” [bold added]*

The FLUKO guidelines also note the need for flexibility in applying the above criteria and **reserve the right of the coordinator to apply them selectively on a case-by-case basis and to add more criteria to the long list:**

“4.13. There is no order of precedence for the individual decision criteria. Depending on the slot supply and demand, and current number of transport connections at this moment in time, as well as of the airlines operating them, the criteria shall be weighed up in an individual case.

4.14. In addition to that, further criteria can be taken into consideration, provided this is notified to the applicants in good time and before the final decision on their applications is made.”

Other coordinators have adopted analogous additional criteria, which may not be stated as explicitly in some cases.

The WSG also provides its own list of additional criteria in paragraph 8.4 of its latest edition (IATA, 2019):

“8.4 ADDITIONAL CRITERIA FOR INITIAL SLOT ALLOCATION

8.4.1 When slots cannot be allocated using the primary criteria as set out in 8.3 above, consideration should be given to the following factors:

a) ***Effective Period of Operation:*** *The schedule that will be effective for a longer period of operation in the same season should have priority.*

b) ***Type of Service and Market:*** *The balance of the different types of services (scheduled, charter and cargo) and markets (domestic, regional and long haul), and the development of the airport route network should be considered.*

c) ***Competition:*** *Coordinators should try to ensure that due account is taken of competitive factors in the allocation of available slots.*

d) ***Curfews:*** *When a curfew at one airport creates a slot problem elsewhere, priority should be given to the airline whose schedule is constrained by the curfew.*

e) ***Requirements of the Travelling Public and Other Users:*** *Coordinators should try to ensure that the needs of the travelling public and shippers are met as far as possible.*

f) ***Frequency of Operation:*** *Higher frequency such as more flights per week should not in itself imply higher priority for slot allocation.*

g) ***Local Guidelines:*** *The coordinator must take local guidelines into account should they exist. Such guidelines should be approved by the Coordination Committee or its equivalent.” [bold added]*

The following two observations can be made on the basis of these examples:

(i) Several of the “additional criteria” in the WSG [see, for example, item e) above] or among those used by local or national coordinators **lack specificity and/or are subject to alternative interpretations when it comes to applying them.**

(ii) Additional criteria complicate significantly the slot allocation process: they are difficult to apply consistently because the hierarchy and

meaning of the criteria is not clear; and they frequently give rise to questions concerning the transparency of slot allocation decisions.

Addendum 2.2: The August 2019 version of the WSG (IATA, 2019b) has added “Time Spent on Waitlist” as another additional criterion.

§2.6. In conclusion, the complexity of the slot allocation task (multiple coordination parameters, priority rules, schedule regularity constraints, diversity of issues across airports, additional criteria of unclear relative priorities) has important negative consequences. In broad terms:

- **It has become extremely difficult to assess the quality of the outcomes of any particular slot allocation, especially at the busiest and most important airports. Questions like “Is this allocation optimal, in the sense of making best use of the limited airport infrastructure to the benefit of the consumer?” are essentially unanswerable today, even if one accepts all the premises and principles of the existing slot allocation process.**
- **Moreover, this inability to truly assess performance also leads inevitably to concerns regarding the transparency and fairness of the process.**

2.2 Unused Allocated Slots

§2.7. A key issue concerning the slot allocation process is whether it makes efficient use of the capacity available at Level 3 airports. One aspect of this issue is **the extent to which slots that were allocated to airlines at the beginning of the process eventually go unused for any reason**. This latter question can be addressed, in part, by tracking the evolution of the number of allocated slots over a small number of key dates during a season.

The first key date in this respect is the *SAL Deadline*. SAL stands for “Slot Initial Allocation List”, i.e., the list of the slots that the coordinator has allocated to each airline during the initial stage of the process at each Level 3 airport²⁸. The SAL provides a draft schedule for the upcoming season, one that is expected to be consistent with the declared capacity of the various elements of the airport. The SAL Deadline is the date by which airlines must be notified of the results of the initial allocation step. For S19, the SAL Deadline was November 1, 2018. The deadline generally falls about 5 months before the beginning of each scheduling season.

Some or many of the slots allocated on SAL Deadline may go unused during a season for several reasons. One of them is **uncertainty**, a fundamental trait of the air transport environment. Airlines must submit to coordinators requests for slot series almost 6 months before a season begins (e.g., in early October for the Summer season that begins in late March) and as long as more than a year before that season ends. Airline submissions must therefore **hedge against uncertainty** regarding potential changes in airline strategies, market conditions, political events (e.g., “Brexit”), aircraft availability/deliveries (e.g., Boeing 737 MAX), etc. **The slot allocation process by itself may also force airlines to abandon some series**. For example, as each airport is coordinated in isolation and as any flight between two Level 3 airports, A and B, requires an arrival slot and a departure slot, it is possible that the airline will receive the requested series of departure slots at A, but not the corresponding arrival slots at B. In such a case, it will not be able to operate its approved departure series at Airport A. A third possibility is that **some airlines may**

²⁸ SALs are also issued by Level 2 airport facilitators.

engage in intentional over-bidding and in gaming of the system for the purpose of “strategic hoarding” of slots. These are but some of the instances whose **overall net effect is that airlines may request initially and receive on SAL Deadline more slots than they will be able to operate or truly intended to operate.**

Most, but not all, decisions to not use certain series or individual slots are made around the second of the aforementioned key dates, the *Slot Return Deadline* (SRD), “the date by which airlines must return series of slots they do not intend to operate”²⁹ (IATA, 2019). Interestingly, the SRD is a date explicitly identified in the WSG, but not in Regulation 95/93, which makes reference solely (and in an indirect way) to the *Historics Baseline Date* (HBD, see below). The SRD is therefore not a formally designated deadline in the “calendar” of Level 3 airports that are subject to Regulation 95/93. In practice, however, it plays a significant role even at these airports, as will be discussed later.

The SRD for each season is a fixed date, falling on January 15 and August 15 for the Summer and Winter seasons, respectively, each year. However, following recent deliberations by representatives of airlines, airports and coordinators, these dates have been moved to one month earlier for the upcoming next three seasons – to July 15, 2019 for W19/20, December 15, 2019 for S20, and July 15, 2020 for W20/21 (IATA, 2019). Moreover, the SRD has been renamed as the *Series Return Deadline* (instead of *Slot Return Deadline*) – see also Section 2.3.3. We shall make no further reference to the SRD in this section – as it is not a formally recognized date in the allocation process of the States that abide by Regulation 95/93.

The next key date is the *Historics Baseline Date* (HBD), “the reference date used for the 80% usage calculation to determine historic precedence” (IATA, 2019). Airlines should have returned by that date any allocated series or individual slots they do not intend to use. The coordinator may have also been able to replace some of the

²⁹ More explicitly, the coordinator’s initial slot allocation may have included some series that the airline had originally requested, but no longer wishes to operate. The SRD gives an airline the opportunity to return these series to the coordinator for possible re-allocation to other airlines, without penalizing in any way the series-returning airline for non-use of the slots (see also Section 2.3.1).

returned series with other series that may have been waitlisted after the SAL Deadline or with series that may have been requested after the SRD (i.e., after any slot openings, due to returned series, become known). The series of slots held by each airline on HBD become the basis for the granting of historic precedence (grandfather rights). In other words, **any slot series held by an airline on HBD** (i.e., after all airlines have had a chance to return series or individual slots³⁰ they do not intend to use) **must be utilized at least 80% of the time³¹ if that series is to enjoy historic precedence in the next equivalent season.**

The schedule for the upcoming season is thus largely finalized by HBD, but short-term changes are still possible. These may include the addition before or after the start of the season of *ad hoc* individual slots or even of newly-requested slot series. The HBD for the Summer and Winter seasons fall on fixed dates – January 31 and August 31, respectively – according to both Regulation 95/93 and the WSG.

Finally, the last two dates of interest are the start (“Season Start”) and end (“Season End”) of the season (March 31 and October 26, respectively, for S19).

§2.8. Figure 2.1 shows a typical example of the evolution of the number of slots at a major Level 3 airport. For the airport of Frankfurt (FRA), the vertical axis shows the total number of slots planned or actually operated during three consecutive summer seasons (S16, S17 and S18) on every day of the season, beginning with the SAL Deadline on the left and ending with Season End on the right³². Several observations can be made:

- The number of slots remains relatively constant between the initial allocation (SAL Deadline) and shortly before SRD, a period that also includes the (Winter or Summer) Slot Conference, negotiations between airlines and the coordinator, and possible exchanges of slots between airlines.

³⁰ See Section 2.3 for further details.

³¹ As will be seen in Section 2.3.1, there is at present significant room for “gaming” this limit.

³² SRD and HBD, as already noted, fall on fixed dates on the calendar of the WSG (SRD is not referenced in Regulation 95/93) while the SAL Deadline, Start of Season and End of Season vary slightly from year to year (and appear only in the WSG calendar).

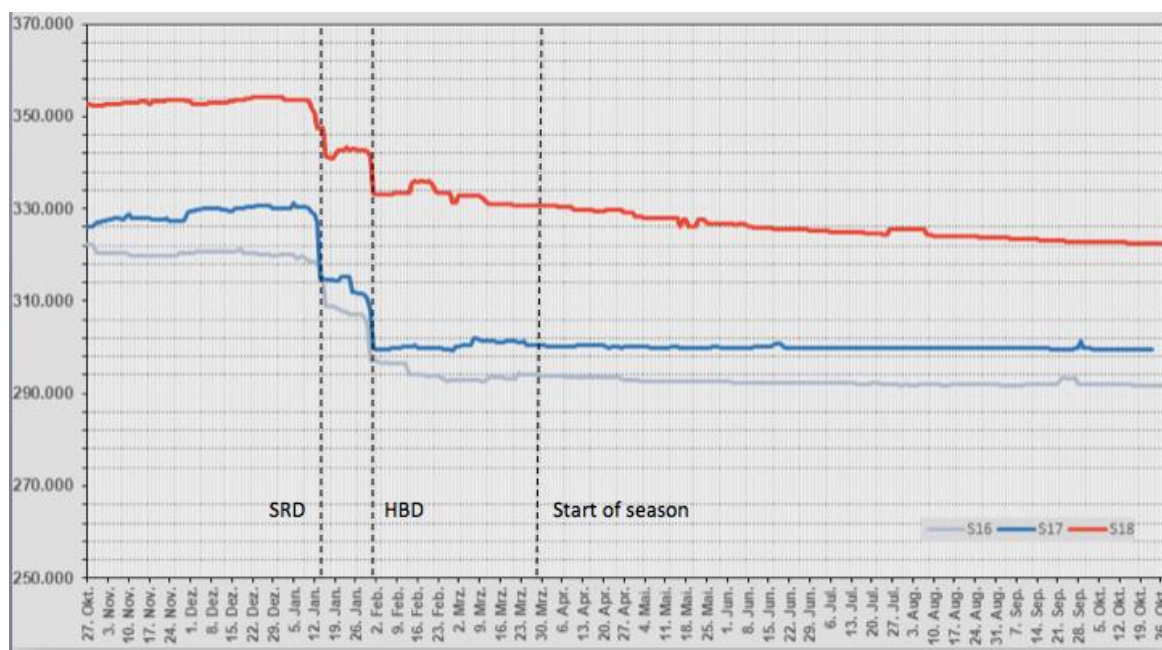


Figure 2.1: Evolution of the number of allocated slots at FRA in three consecutive summer seasons (S16, S17, S18). (Source: Fraport.)

- A two-step reduction in the number of slots occurs during the roughly 25-day period between the second week of January (just before SRD) and HBD at the end of January; this is the time window within which the largest decline in the number of slots typically takes place during the slot allocation process.
- After HBD, the number of slots generally remains relatively constant until Season End, although it is possible to have a decline due to further cancellations (as in the case of S18 in Figure 2.1) or, conversely, an increase due to short-term additions of some flights that were not part of the schedule on HBD; as already noted, the post-HBD period is when the 80% utilization rate must be met in order for a series to qualify for historic precedence in the next equivalent season.

§2.9. In an effort to observe the evolution of the number of slots that are expected to be filled or are actually filled over the course of a season, data have been collected from 18 major Level 3 airports in the EU, Norway and Switzerland for a total of 44 Summer seasons in S16, S17, S18 and S19. These four years have been part of one of the longest periods of sustained and strong demand growth in the history of European air transport.

Airport	Season	(1) Slots SAL	(2) Slots HBD	(3) Slots Season Start	(4) Slots Season End	(5) Δ% (2)/(1)	(6) Δ% (3)/(1)	(7) Δ% (4)/(1)	(8) Δ% (4)/(2)
AMS	S17	313,740	313,170	313,339	318,484	-0.2	-0.1	1.5	1.7
AMS	S18	313,740	313,260	313,683	315,018	-0.2	-0.0	0.4	0.6
BCN	S16	211,000	196,000	198,000	195,000	-7.1	-6.2	-7.6	-0.5
BCN	S17	228,000	201,000	204,000	204,500	-11.8	-10.5	-10.3	1.7
BCN	S18	243,000	215,000	213,000	213,000	-11.5	-12.3	-12.3	-0.9
DUB	S16	146,318	133,607	134,003	126,129	-8.7	-8.4	-13.8	-5.6
DUB	S17	154,239	142,521	140,077	136,211	-7.6	-9.2	-11.7	-4.4
DUB	S18	160,756	151,126	149,071	143,457	-6.0	-7.3	-10.8	-5.1
DUS	S16	152,484	140,249	138,732	135,338	-8.0	-9.0	-11.2	-3.5
FRA	S16	320,403	296,633	293,975	288,804	-7.4	-8.2	-9.9	-2.6
FRA	S17	326,000	300,000	300,500	299,000	-8.0	-7.8	-8.3	-0.3
FRA	S18	353,000	334,000	330,000	322,000	-5.4	-6.5	-8.8	-3.6
GVA	AVE WK 5 YR	3,260	2,930	2,904	2,849	-10.1	-10.9	-12.6	-2.8
GVA	AVE WK S18	3,260	2,897	2,882	2,814	-11.1	-11.6	-13.7	-2.9
GVA	AVE WK S19	3,260	2,917	2,882	-	-10.5	-11.6	-	-
HAM	S16	102,667	93,706	92,988	90,266.0	-8.7	-9.4	-12.1	-3.7
LGW	S16	192,859	189,973	186,903	178,706	-1.5	-3.1	-7.3	-5.9
LGW	S17	195,281	193,137	188,537	172,054	-1.1	-3.5	-11.9	-10.9
LGW	S18	191,501	198,498	190,848	180,787	3.7	-0.3	-5.6	-8.9
LHR	S16	297,893	296,722	293,925	288,999	-0.4	-1.3	-3.0	-2.6
LHR	S17	298,659	298,429	294,195	289,042	-0.1	-1.5	-3.2	-3.1
LHR	S18	299,008	298,936	294,915	289,099	-0.0	-1.4	-3.3	-3.3
MAD	S16	257,000	222,000	222,000	224,000	-13.6	-13.6	-12.8	0.9
MAD	S17	255,000	224,000	225,500	230,000	-12.2	-11.6	-9.8	2.7
MAD	S18	274,000	239,000	240,000	244,000	-12.8	-12.4	-10.9	2.1
MUC	S16	273,876	246,562	241,732	237,212	-10.0	-11.7	-13.4	-3.8

Airport	Season	(1) Slots SAL	(2) Slots HBD	(3) Slots Season Start	(4) Slots Season End	(5) Δ% (2)/(1)	(6) Δ% (3)/(1)	(7) Δ% (4)/(1)	(8) Δ% (4)/(2)
MUC	S17	294,154	250,717	247,208	243,646	-14.8	-16.0	-17.2	-2.8
MUC	S18	299,820	261,915	253,239	246,849	-12.6	-15.5	-17.7	-5.8
MUC	S19	281,992	256,064	249,801	-	-9.2	-11.4	-	-
OSL	S17	161,924	153,279	151,648	156,671	-5.3	-6.3	-3.2	2.2
OSL	S18	166,207	159,070	158,344	160,452	-4.3	-4.7	-3.5	0.9
OSL	S19	161,041	149,412	-	-	-7.2	-	-	-
PMI	S16	168,000	153,000	152,500	152,500	-8.9	-9.2	-9.2	-0.3
PMI	S17	201,500	165,000	165,000	163,500	-18.1	-18.1	-18.9	-0.9
PMI	S18	211,500	190,000	182,000	177,500	-10.2	-13.9	-16.1	-6.6
STR	S16	81,410	70,273	69,940	67,996	-13.7	-14.1	-16.5	-3.2
SXF	S16	57,065	50,533	50,320	51,298	-11.4	-11.8	-10.1	1.5
TXL	S16	139,494	116,053	115,060	112,582	-16.8	-17.5	-19.3	-3.0
VIE	S17	182,201	148,374	147,098	145,092	-18.6	-19.3	-20.4	-2.2
VIE	S18	176,793	157,971	155,015	154,483	-10.6	-12.3	-12.6	-2.2
VIE	S19	200,353	174,913	171,445	-	-12.7	-14.4	-	-
ZRH	AVE WK 5 YR	5,629	5,105	5,035	4,856	-9.3	-10.6	-13.7	-4.9
ZRH	AVE WK S18	5,948	5,396	5,245	5,029	-9.3	-11.8	-15.5	-6.8
ZRH	AVE WK S19	5,907	5,201	5,188	-	-12.0	-12.2	-	-

Table 2.2: Slots allocated or actually utilized on four key dates of a season at a sample of 18 Level 3 airports in the EU, Norway and Switzerland.

Sources of data:

ACL provided the data for DUB, LGW and LHR; AECFA (Spain Coordinator) for BCN, MAD and PMI (an approximate number of slots has been estimated from graphs provided); Amsterdam Schiphol Airport for AMS; SCA (Austria Coordinator) for VIE; FLUKO (Germany Coordinator) for DUS, FRA, HAM, MUC, STR, SXF and TXL in S16; Fraport for FRA in S17 and S18 (an approximate number of slots has been estimated from graphs provided); Flughafen München for MUC in S17, S18 and S19; ACN (Norway Coordinator) for OSL; SCS (Switzerland Coordinator) for GVA and ZRH.

Columns (1)-(4) of Table 2.2 show the number of slots on the four key dates (SAL Deadline, HBD, Season Start, Season End), while Columns (5)-(8) show the percent changes for the indicated pairs of columns (e.g., Column (5) shows the percent increase/decrease of the number of slots on HBD relative to that on the SAL Deadline). Because the data were obtained from multiple sources, their completeness and granularity vary considerably, as do the seasons reported.

The questions of interest concern, first, the overall change that takes place between the SAL Deadline and Season End [Column (7)] and, second, how this change is distributed between the pre-HBD and post-HBD time periods involved. With respect to the first question, note that, with the exception of AMS (see §2.10 below), the number of allocated/utilized slots declines at all airports and on all seasons for which data are available in Table 2.2. The decline ranges from a maximum of 20.4% (VIE in S17) to a minimum of 3.0% (LHR S16), with most being in the -8% to -15% range.

Regarding the second question, the greater (usually by far) portion of this overall loss in number of slots occurs before HBD in most cases, i.e., between the SAL Deadline and HBD. The percentages observed in Table 2.2 [Column (5)] range from a decline of 18.6% (VIE S16) to a (sole) increase of 3.7% (LGW S18). By contrast the change between HBD and Season End [Column (8)] is usually much smaller, ranging between a decline of 10.9% (LGW S17) and an *increase* of 2.7% (MAD S17) – with several airports actually reporting some small increases, apparently due to *ad hoc* requests by airlines to add flights.

§2.10. Amsterdam’s Schiphol Airport (AMS) provides an interesting case study in this context. As Table 2.2 indicates, the number of allocated/utilized slots at AMS did not decline through the various key dates during both the S17 and S18 seasons and, in fact, the number of actually operated slots in both seasons was *greater* at Season End than the number allocated on the SAL Deadline. Table 2.3 shows in detail how this happened by also listing the number of slots associated with requests that were waitlisted by the coordinator on the SAL Deadline, HBD and Season Start of each of the two seasons. In effect, the “pool” of waitlisted slots was used in order to replace any cancelled flights and cancelled series. In addition, in both S17 and S18, the slot

	S17		S18	
	Allocated slots	Waitlisted Slots	Allocated Slots	Waitlisted Slots
SAL	313,740	60,762	313,740	42,062
HBD	313,170	35,785	313,260	32,284
Season Start	313,399	10,449	313,683	13,861
Season End	318,464	--	315,018	--

Table 2.3: Number of allocated/utilized slots and waitlisted slots on key dates at AMS in S17 and S18. (Source: Amsterdam Schiphol Airport.)

limit for AMS for the Summer season was increased by the competent authorities (and was correspondingly reduced for the Winter season), making it possible for the airport to exceed the initial allocation target set on the SAL Deadline.

It is also interesting to note that the number of waitlisted slots declined between the SAL Deadline and the Season Start by roughly 50,000 and 30,000, respectively, in S17 and S18. This implies that, of the 313,740 slots initially allocated in both S17 and S18, roughly 50,000 and 30,000, respectively, were cancelled and replaced by waitlisted slot requests. Thus, the cancelled slots represented, overall, approximately 16% (i.e., 50,000 out of 313,740) and 10% (30,000 out of 313,740), respectively, of the initially allocated slots in S17 and S18. Both of these percentages are consistent with those reported by other airports [see Column (6) of Table 2.2] that do not have a large number of waitlisted requests that can fill the gaps left by cancelled slots.

Closer inspection also shows that the pattern of the evolution of the number of slots at LHR and, to a lesser extent, at LGW is very similar to the one at AMS. These two airports are as saturated as AMS (see Section 3.3), when it comes to slot availability, and can use, before HBD, their “pool” of waitlisted slots to replace most cancelled series.

As more airports reach the full saturation levels currently experienced at AMS³³, LHR and LGW (and will thus be forced to maintain long lists of waitlisted slot requests), **it is reasonable to expect that (i) the mode in which AMS currently**

³³ AMS has not reached the limits of its physical capacity; its slot availability is constrained by environmental considerations.

operates, as shown in Table 2.3, will become more common and (ii) the management of waitlists of slot requests will come under increased scrutiny.

The way and order in which waitlisted slots are processed when slot openings become available after the SAL Deadline may well turn into a subject of controversy.

§2.11. While the information in Table 2.2 covers only 18 airports over 44 Summer seasons, the pattern that it suggests is sufficiently consistent³⁴ across airports and seasons to permit making a couple of important **conjectures**, under the crucial assumption that this sample of airports is fairly representative of the entire group of larger Level 3 airports in the 32 States:

(a) Roughly 1 out of 10 of the slots that are allocated to the airlines at the beginning of each Summer season (i.e., on SAL Deadline) are either returned or cancelled by the end of the season; most of these slots go unused (are “lost”) with the exception of a very few airports, such as Amsterdam Schiphol and London Heathrow, where waitlisted requests can largely replace returned and cancelled series and slots.

(b) More than 80% of the returns and cancellations of allocated slots take place before HBD.

An additional *caveat* is that all the data shown in Table 2.2 refer to years of strong growth when airlines are less likely to return slots or cancel flights. It is possible that the rates at which series and individual slots are returned and/or cancelled during “lean” years will be greater than those suggested in (a) above or that their distribution between pre- and post-HBD different.

³⁴ The evolution of the number of slots over a season shown in Table 2.2 is also remarkably consistent with the pattern shown in Table 5.14 (p. 113) of the Steer Davis Gleave (2011) report based on data from S08 and S10.

2.3 Reducing the Number of Unused Allocated Slots

§2.12. The two conjectures in §2.11 provide useful guidance for promising directions to pursue in order to reduce the number of unused allocated slots. First, it was estimated that, for the large sample of major Level 3 airports in Table 2.2, the number of slots that are actually used by the Summer season's end is, on average, about 10% smaller than the number allocated on SAL Deadline, with the exception of a few "saturated" airports where the number of slots that eventually go unused is reduced through the long waitlists that these airports maintain. At current traffic levels, the annual number of commercial air traffic movements with passengers (ATMP) at Level 3 airports in the 32 States that apply Regulation 95/93, is of the order of 11 million (for example, it was 10.7 million in 2018 – Column (4) of Table 1.3). If the roughly 10% rate also holds for Winter seasons, it follows that (i) **the number of returned and cancelled slots could be of the order of 1 million per year** – or about the same as the total number of slots available annually at any two of the four busiest airports in the EU (AMS, CDG, FRA and LHR) and (ii) **the number of "lost" slots** – i.e., allocated slots that are not replaced and go unused – **is smaller, but of a similar order of magnitude.**

This does not mean that any simple remedies exist for somehow "recovering" this very large number of slots. As noted in §2.7, the realities of the flight planning and scheduling process make it necessary for airlines to hedge against uncertainty and to request, typically, more slots than they will eventually use. The propensity to do so is reinforced by the advantages of holding sizable portfolios of slots and of retaining grandfather rights to them. There is therefore **a natural tendency toward having large numbers of unused allocated slots at major Level 3 airports**, with the exception of the "super-congested" ones (Section 3.3), such as LHR and AMS, which often end up with long waitlists of slot requests after the SAL Deadline (or where much latent demand exists). It is far from easy to solve this problem. But an array of tactical measures can be considered for partially counteracting this tendency. Any such measures that prove to be even moderately successful could translate into tens of thousands of allocated slots that are utilized, instead of going unused.

The second conjecture of §2.11 provides some guidance in this respect as it suggests that **efforts to reduce the number of unused allocated slots should focus primarily on measures directed to the pre-HBD part of the process** that accounts for more than 80% of the unused allocated slots.

Based on these observations, this section reviews briefly the following set of measures that have been proposed for reducing the number of unused allocated slots:

- (i) Closing the “double-dip” loophole.
- (ii) Modifying the 80% utilization rate requirement.
- (iii) Changes to critical dates and deadlines on the timeline of the slot allocation process.
- (iv) Slot reservation systems.
- (v) Increasing the minimum required length of slot series.
- (vi) Hedging against uncertainty regarding slot use.

Strictly speaking, measures (v) and (vi) aim at increasing the number of slots that are allocated on SAL Deadline, not reducing the number of unused allocated slots. But the eventual result still amounts to reducing the gap between the number of slots that *could* be utilized and the number which *are* actually utilized.

2.3.1 The “Double-Dip Loophole”

§2.13. As noted in §2.9 and §2.11, the great majority of slot returns and cancellations currently take place pre-HBD, i.e., during the time between the SAL Deadline and HBD. Most of these returns and cancellations occur around the Series Return Deadline (SRD) – which, as already noted, is not an official date on the calendar of Regulation 95/93, but still serves as an informal milestone because it is specified as such in the WSG – as well as during the time between the SRD and the HBD.

A change that first appeared in the WSG’s 2007 edition (known, at the time, as the *Worldwide Scheduling Guidelines*) has opened a loophole around the “80% usage” rule³⁵ and may be contributing significantly to the number of pre-HBD slot returns and cancellations. The change in question dealt with the conditions under which a

³⁵ The change was reportedly made without consulting with airport operators.

slot series is eligible for historic precedence (“grandfather rights”) and made it possible to **cancel up to 20% of the individual slots in a series before HBD, without this affecting the eligibility of the series for historic precedence.** Specifically, when referring to cancellations of slots in any slot series allocated by the coordinator on the SAL Deadline, the relevant paragraphs of the WSG state (IATA, 2019):

“8.7.2 Cancellations before the Historics Baseline Date

8.7.2.1

8.7.2.2 The cancellation of periods of less than 5 consecutive weeks does not reduce the period eligible for historic precedence, provided the total number of cancellations is 20% or less of the period between the first and last date of the series of slots.

8.7.3 Cancellations after the Historics Baseline Date

8.7.3.1 All cancellations made after the Historics Baseline Date are considered as non-utilization of the series of slots in the 80% usage calculation, unless the non-utilization is justified on the basis of the provisions of 8.8.”

The combination of **Paragraphs 8.7.2.2 and 8.7.3.1 essentially makes it possible for a carrier to cancel up to 20% of the slots in a series before HBD and cancel an additional up to 20% after HBD and still have the entire original series qualify for historic precedence.** The resulting slot cancellation strategy is now often referred to as the “*double-dip loophole*”, because its net effect is to circumvent or dilute the intent of the original 80-20 rule by permitting two rounds of cancellations of up to 20% of the slot series in each round.

The double-dip loophole is a good example of one of the general problems that were identified in Chapter 1 (§1.10) about the way Regulation 95/93 is being applied in practice: the WSG often serves as the *default* reference in instances that are not explicitly addressed by the Regulation. In this particular case, Regulation 95/93 is unclear about the details of how pre-HDB and post-HDB cancellations affect eligibility for historic precedence. In the absence of clear guidance, some

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Initial Slot Allocation (SAL): Airline AAA has requested (and the coordinator has allocated to it on the SAL Deadline) a series of 31 slots, denoted with an O, for every Monday of a 31-week Summer season:																															
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cancellations before the HBD: Before the HBD, Airline AAA “returns” 6 slots, denoted with a bold black X below; this represents fewer than 20% of the 31 slots in the series and thus complies with Paragraph 8.7.2.2 of the WSG (IATA 2019):																															
0	0	0	0	0	X	X	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	X	X	0	0	0	0	0	
Cancellations after the HBD: After the HBD, Airline AAA cancels 5 additional slots (denoted with a bold red X below); this represents exactly 20% of the 25 slots (=31-6) remaining in the series; it therefore complies with the 80-20 rule (Paragraph 8.7.3.1 of the WSG, 2019 Edition):																															
0	0	X	0	0	X	X	X	0	X	0	0	X	0	0	0	0	0	0	0	X	0	0	X	X	X	0	0	0	X	0	
The Result: At the end of the season Airline AAA has operated only 20 of the initially allocated 31 slots, denoted below with an O; this represents just 64.5% of the slots in the initially allocated series; yet, the full initial series of 31 slots is eligible for historic precedence for the next Summer season.																															
0	0		0	0				0		0	0		0	0	0	0	0	0		0	0					0	0	0		0	

Table 2.4: An example of the “double-dip” loophole in a 31-week Summer season: an airline may operate only 20 of 31 slots in a series (64.5%) and still obtain grandfather rights for the full series of 31 slots.

coordinators apparently treat the above-cited Paragraph 8.7.2.2 as the by-default guideline and the double-dip has become part of current practice³⁶.

§2.14. Table 2.4 presents an example of how the double-dip loophole works in the instance of an airline that, on SAL Deadline, has been allocated a slot series consisting of 31 slots – one in every Monday of the 31 consecutive weeks (shown at the top of the table) of a 31-week Summer season. Under the rules of Paragraph 8.7.2.2 of the WSG, the airline may cancel up to six slots in the series *before HBD*, as long as cancellations do not occur in 5 consecutive weeks. Under Paragraph 8.7.3.1, the airline may also cancel up to 5 of the *remaining* 25 slots in the series (20%) *after HBD*. The successive steps are shown in Table 2.4, with “X”, in black for pre-HBD and red for post-HBD, denoting a cancelled slot. In the end, *only 20 of 31 slots have been operated, a 64.5% utilization rate, yet this series has qualified for historic precedence as a series of 31 slots, despite the “80-20” rule!*

The percentage of operated slots needed to qualify for historic precedence depends, of course, on the length of the historic series. For example, a series of 30 slots can qualify if 10 slots are cancelled (6 under Paragraph 8.7.2.2 and 4 under 8.7.3.1), i.e., if only 20 out of 30 slots in the series (66.7%) are operated. A recent report (Heathrow Airport Limited, 2019) offers examples of slot series that were utilized at rates as low as 67% during W17/18 and W18/19 and still qualified for historic precedence through the double-dip loophole at LHR, possibly the world’s most slot-constrained airport with slot values in the tens of millions of euros in the secondary trading market (Section 3.2).

§2.15. In conclusion, the “double-dip” is a practice that calls for a review by the Commission. Paragraph 8.7.2.2 of the WSG is in conflict with the spirit and intent of Article 8(2) of Regulation 95/93 requiring that historic precedence rights be granted

³⁶ Some coordinators reportedly do not treat the double-dip as an acceptable practice (see also Section 3.5 on transparency), but it is difficult to ascertain the extent to which this is the case.

if “the air carrier can demonstrate to the satisfaction of the coordinator that the series of slots in question has been operated, as cleared by the coordinator, by that air carrier for at least 80% of the time during the scheduling period for which it has been allocated”.

The Series Return Deadline is defined in the WSG as “the date by which airlines must return **series** of slots that they do not intend to operate” (Chapter 10, IATA 2019), i.e., the SRD is explicitly intended to give airlines the opportunity to return to the coordinator before HBD **entire** slot series (on an “all-or-nothing” basis) that they cannot use, so that the associated slots can be re-allocated, when possible, before HBD. Airlines should also return, as soon as possible, any individual slots (within a series) that they do not intend to use. **But they should not be permitted to return a selected subset of slots (up to 20%) of a series before HBD and another selected subset (up to 20%) after HBD and still have the full original series maintain its eligibility for historic precedence. Eligibility at the end of the season should be considered only for that part (or parts) of the original series that, on HBD, qualifies as a legitimate series of 5 or more slots.**

To remove ambiguity on this matter, it is recommended that Article 10(3) of Regulation 95/93 be amended. The amendment could consist of adding to Article 10(3) a sentence like the one shown in **bold italics** below, so that the full Article would read as follows:

*“Slots allocated to an air carrier before 31 January for the following summer season, or before 31 August for the following winter season, but which are returned to the coordinator for reallocation before those dates shall not be taken into account for the purposes of the usage calculation. **Only the slots in a series that have not been returned before 31 January (for the following summer season) or before 31 August (for the following winter season) shall be eligible for historic precedence.**”*

Addendum 2.3: No changes to Paragraphs 8.7.2.2 and 8.7.3.1 have been made in the August 2019 version of the WSG (IATA, 2019b). The “double dip” is therefore still possible under this latest version of the WSG.

2.3.2 Modifying the 80% usage requirement

§2.16. Turning to the post-HBD stage of the Slot Allocation Process, the “80-20 use-it-or-lose-it” rule has been the subject of considerable discussion over the years. The frequently asked question is whether the “80% usage” threshold should be raised, e.g., to 85%, or 90%, in order to reduce the number of unused allocated slots. The argument is that the 80% requirement is too low and contributes to increasing the number of unused allocated slots in cases where an airline is “sitting” on a series in order to retain historic precedence. Such instances may be more common at less congested Level 3 airports and in years when traffic is weak.

It is important to consider this question in a broader context, namely by recognizing that, in the presence of the double-dip loophole, a post-HBD reduction in the number of unused allocated slots could be (partly or fully) negated by a corresponding increase in the number of unused allocated slots *before* HBD. As a coordinator wrote in a personal communication on this issue, *“if 85/15 or 90/10 would become reality, airlines would just cancel one or two more movements before HBD.”* It will therefore be assumed here that **any increase in the 80% threshold for slot cancellations after HDB would be accompanied by a discontinuation of the double-dip loophole, as recommended in Section 2.3.1.**

Table 2.5 summarizes data concerning series that had utilization rates between 80% and 89% in three recent Summer seasons in Vienna and at three major Level 3 airports in Spain. The table shows the percent of slot series that had utilization rates between 80% and 84%, between 85% and 89% and between 80% and 89%. All the percentages shown are small, with the share of series with utilization rates between 80% and 89% (rightmost column) ranging from 2.1% to 5.4%, with an overall rate of 3.5%. The percent of series with utilization rates between 80% and 84% was roughly the same as the percent with rates between 80% and 85%. These observations are based on only 4 airports³⁷, but they are quite consistent across these airports and across seasons. They are also consistent with

³⁷ A few other coordinators indicated that they could not supply similar data at the level of granularity shown in Table 2.5.

		Total Number of Series	Series with Utilization 80-89%	% Series with Utilization 80-84%	% Series with Utilization 85-89%	% Series with Utilization 80-89%
MAD	S18	14403	348	1.1	1.3	2.4
	S17	13987	289	1.0	1.1	2.1
	S16	13018	380	1.4	1.5	2.9
BCN	S18	11441	405	1.6	1.9	3.5
	S17	11506	318	1.5	1.3	2.8
	S16	12560	675	3.0	2.4	5.4
PMI	S18	12109	467	2.0	1.8	3.9
	S17	12498	482	2.0	1.8	3.9
	S16	12298	453	2.1	1.5	3.7
VIE	S18	5692	261	2.1	2.5	4.6
	S17	5468	202	1.6	2.1	3.7
	S16	5721	266	2.2	2.4	4.6
Total		130701	4546	1.8	1.7	3.5

Table 2.5: Series with utilization rates between 80% and 89% and their share of total number of series. (Sources: AECFA – Spain and SCA - Austria Coordinators.)

data from LHR and VIE in S10 that are presented in the Steer Davies Gleave (2011) report. It is also noted that Table 2.5 is limited to years with strong traffic demand, during which slot cancellations might be fewer. The possibility exists that a different picture might emerge from data for seasons when demand is weaker.

It is difficult to predict the exact effect of increasing the 80% usage requirement to 85%. Some of the small percent (about 1.8% in Table 2.5) of slot series that currently have utilization rates between 80% and 84% may not be able to meet the new threshold and hence lose their historic precedence. But it is far more likely that airlines will endeavor to increase the utilization rates of these relatively few series, rather than risk losing historic rights to them. **The net effect on slot utilization would therefore probably be positive, i.e., help reduce by a small percentage (of an order similar to the 1.8% in Table 2.5) the number of unused allocated slots. If the threshold is increased to 90%, the net effect is more difficult to predict, because some airlines may not be willing to attain this level of utilization for series that suffer from low passenger demand.**

An additional consideration is that the 80% threshold is the standard set by the WSG and is therefore used on a global scale. A change limited solely to the Regulation will face issues of compatibility with international practice.

Finally, it is noted again that these conclusions are conditioned on the assumption that the double-dip loophole will be discontinued, so that post-HBD slot cancellations cannot be replaced by pre-HBD cancellations.

2.3.3 Changes to Critical Dates and Deadlines in the Slot Allocation Timeline

§2.17. Certain changes in the timing of some of the key dates in the “calendar” of the slot allocation process could contribute to reducing the number of unused allocated slots. Specifically, allowing more time between the Series Return Deadline (SRD) and the Historics Baseline Date (HBD), as well as between HBD and Season Start would be of help to airlines that may consider submitting new requests for replacing returned series and cancelled slots³⁸ of other carriers. It would also give more time to coordinators to process such requests and negotiate further changes to slot assignments that would fill some of the “gaps” created by returned series and cancelled slots.

An important decision in this respect has already been made during the past year through an agreement reached by representatives of airport operators, coordinators and airlines and adopted in the January 2019 edition of the WSG (IATA 2019). For the W19/20, S20 and W20/21 seasons, the SRD has been moved earlier by one month (for example, from January 15, 2020 to December 15, 2019 in the case of S20), thus allowing 1.5 months (instead of half a month) between SRD and HBD (which still falls on January 31, 2020 in the case of S20). No action has been taken to date regarding increasing the time between HBD and Season Start (although the topic has reportedly been discussed by the same group of stakeholders) and none may be taken in the near future.

³⁸ As already noted in Section 2.2, the SRD is not a deadline mentioned in Regulation 95/93. However, it serves as a *de facto* deadline at airports where the Regulation is applied.

On the other hand, it is important to also recognize that lengthening the time between the SRD and Season Start – and, conceivably, between the beginning of the process (the submission of airline requests) and Season Start – also means increased uncertainty about future conditions at the times when airlines have to make their decisions about slot requests, series returns and pre-HDB slot cancellations for the upcoming seasons. More uncertainty means more airline hedging when submitting their slot requests for a season and therefore a higher likelihood that some allocated slots will eventually go unused.

The lengthening by one month of the time interval between SRD and HBD is certainly a step in the right direction and the 1.5-month policy should be continued indefinitely³⁹. This should allow sufficient time for stakeholders to make adjustments to their plans following the return of some series on SRD. **Careful consideration should also be given to a concurrent increase, possibly by 2 weeks, of the time interval between HBD and Season Start.** However, **extending even further the intervals between SRD and HBD and between HBD and Season Start might prove counter-productive.**

§2.18. A related issue stems from the fact that the Regulation does not, at this time, specify a calendar of key dates. As a result, it is difficult to formalize the changes in the timeline of the process that are described in the previous paragraph.

The WSG, by contrast, does provide a detailed timeline through a sequence of specific dates (most of them varying from year to year) as follows:

SHL Deadline → Agreed Historics Deadline → Initial Submission Deadline → SAL Deadline → IATA Slot Conference → SRD → HBD → Season Start → Season End⁴⁰

³⁹ The January 2019 edition of the WSG notes that the SRD dates shown on its calendar (p. 3) are “only for W19/20 and S20 seasons”, but the August 2019 one extends this to W20/21.

⁴⁰ From the WSG (IATA, 2019): “SHL Deadline = the deadline date by which coordinators must provide each airline with the details of their historic slots”; “Agreed Historics Deadline = the deadline ... by which airlines must raise any disagreements with the coordinator’s determination of historic”; “Initial Submission Deadline = the deadline ... by which airlines must submit their planned operations to coordinators”. See Section 2.2 for explanation of remaining milestones and initials.

Regulation 95/93, on the other hand, does not provide any timeline or make reference to one, nor does it mention any of the milestones in the WSG timeline (SHL, Initial Submission Deadline, SAL, etc.). The Regulation only identifies two dates, January 31 and August 31, as the reference dates for determining historic precedence and the slot pool for the Summer and Winter seasons, respectively. These dates serve the same purpose as the “Historics Baseline Dates” (HBD) in the WSG and coincide exactly with the dates for the HBD that are specified in the WSG. The Regulation also ties the timeline of its process to the “calendar” set forth in the WSG by stating that “...the coordinator shall participate in such international scheduling conferences of air carriers as are permitted by Community law” [Article 4(3)], i.e., by requiring that coordinators shall attend the IATA Slot Conferences twice a year. In all other respects, the Regulation essentially defers to the WSG regarding the timeline of the process and its details. In practice, the coordinators of Level 3 airports at which the Regulation is applied do, indeed, adhere closely to the WSG’s timeline.

The Commission should consider whether Regulation 95/93 should continue to defer to the WSG for its calendar or should be amended to specify more milestones (in addition to the HBD) on its own.

The advantage of the first option (*status quo* with a vaguely described calendar) would retain the same degree of flexibility as at present, but would have to continue relying on a tacit agreement among airlines, airport operators and coordinators to apply a timeline roughly consistent with that of the WSG.

The alternative option would require amendments, which, at the very least, would:

- (i) Introduce explicitly into the Regulation’s calendar a new “key date” between the initial slot allocation by coordinators and the HBD that would play the same role as the WSG’s SRD.
- (ii) Call this new key date the *Series* Return Deadline to reflect the requirement that airlines must return by that date any allocated *series* of slots that they will not operate for any reason.

This second alternative would enhance the Regulation’s control of the slot allocation process and provide an unambiguous timeline. It would also align the

Regulation better with current international practice (as described in the WSG), thus providing a better standing for influencing (in the future) the calendar of the process worldwide..

2.3.4 Series and Slot Reservation Systems

§2.19. Series and slot reservation systems could contribute to discouraging the submission of excess requests for slots and the resulting subsequent return of series and cancellation of slots. Careful consideration should therefore be given to permitting or even encouraging the development and application of such systems. It is particularly important that the systems be revenue neutral for airlines and airport operators alike. It is also desirable that the systems not require any advance payments by the airlines. Several proposals along these lines have been discussed over the years.

In the period *before HBD*, the main focus should be on reservations for *series of slots*. After the Series Return Deadline (SRD), a “*series return charge*” could be imposed on airlines that cancelled series that ***have been allocated the same slot time as the one that the carrier had originally requested***. The requested slot time presumably reflects the top preference of the carrier, so the series return charge would in effect be a penalty for canceling the series despite its being granted that slot time. No charge would be imposed for the cancellation of any series assigned to a slot time different from the one requested. The scheme would be made revenue neutral for the airport operator and for airlines *collectively* through appropriate adjustments to the charged landing and takeoff fees once the season begins.

In the period *after HBD*, a fee could be charged for slots that were not cancelled by HBD *and* were not eventually used. A possible model for such a reservation system is the “Allocation Charge for Airport Infrastructure” scheme, which was implemented successfully, with government approval, at Düsseldorf Airport (DUS) in 2003 and 2004⁴¹ (Honerla, 2018). The scheme basically consisted of having each carrier pay an infrastructure charge each month for each of the

⁴¹ The “allocation charge for airport infrastructure” scheme at DUS ended when the airport adopted a new system of charges after 2004.

carrier's flights scheduled for that month that were *not* operated for reasons other than those set out in Article 10(4) of the Regulation. Landing and takeoff charges for flights that were actually operated during the month were then appropriately adjusted downward to arrive at a revenue neutral overall result. The DUS scheme is believed to have contributed to an increase in the utilization rate of slots at DUS. Specifically, the utilization rate of slots (as of HBD) is reported to have gradually increased from roughly an 85% rate before S04 to a quite steady rate of 94% - 95% throughout the seasons between S07 and S17 (Honerla, 2018).

2.3.5 Increasing the Minimum Required Length of a Slot Series

§2.20. The Regulation currently defines [Article 2(k)] a slot series as consisting of “*at least five slots having been requested for the same time on the same day of the week regularly in the same scheduling period*”. However, slot allocations at many Level 3 airports might benefit considerably from increasing the minimum required length of a series. It is easy to construct examples in which short series with historic precedence may make it impossible to schedule longer series by “blocking” slot availability during key times. For instance, a short series (e.g., of five slots) may be scheduled for only the peak weeks of a season, thus depriving much longer series, possibly season-long ones, of access to the airport over an entire season.

To address this problem an increase in the required minimum length of a series has often been proposed in recent years. The 2011 Proposal includes such a change in its Article 2(13): “*'series of slots' shall mean at least 15 slots for a summer scheduling period and 10 slots for a winter scheduling period requested for the same time on the same day of the week for consecutive weeks⁴²...*”.

This change would, in principle, reduce the “blocking” impact of short series and should be considered favorably for adoption. This would not, in fact, mean a

⁴² Note that the cited Article 2(13) of the 2011 Proposal would also provide a much-needed clarification of the current Article 2(k) of the Regulation. Specifically, where Article 2(k) states that the slots of a series will be “*requested for the same time on the same day of the week **regularly** in the same scheduling period*”, the proposed Article 2(13) states “*requested for the same time on the same day of the week **for consecutive weeks***”. Article 2(13) of the 2011 Proposal thus makes clear that “regularly” means “for consecutive weeks”.

radical departure from the *status quo*. In practice, most slots allocated at the busiest Level 3 airports are parts of long series, anyway. For example, at CDG about 53% of the roughly 302000 slots allocated in S18 were part of season-long series of 31 slots and about 75% were part of series of 25 or more slots, with similar percentages for S17 (Pouget et al, 2019). Only about 7% of slots were associated with series of fewer than 15 slots. The Steer Davies Gleave (2011) report presents data from LHR, LGW and PMI that indicate a similar pattern. Thus, the above Article 2(13) of the 2011 Proposal would affect only a relatively small number of slot assignments.

§2.21. Several practical difficulties arise, however, in connection with increasing the required series length. First, certain types of airports, especially those with highly seasonal traffic, may prefer the existing requirement of 5 slots (or a similarly small number). This gives them the opportunity to accommodate many short-term series, e.g., for flights by charter operators limited to certain parts of the season. A second difficulty is that most of the short series that would otherwise have been affected by Article 2(13) of the 2011 Proposal (i.e., Summer series with length between 5 and 14 slots and Winter series of between 5 and 9) already enjoy historic precedence. Thus, even after a change in the series length requirement, carriers would be able to continue to operate these short series, unless the historic precedence of such series was somehow revoked.

For these reasons, it has been suggested that a flexible approach be adopted that would treat the minimum required length of a slot series as an airport-specific option, with each Level 3 airport being allowed to specify its own minimum required length. This alternative, however, would still have to address similar difficulties. For one, the length of the slot series for any particular flight between two Level 3 airports, A and B, has to be acceptable at both ends of the flight. But this may not be true for series requested between two airports that impose different minimum length requirements. Would the longer or the shorter of the two requirements apply in such cases? Moreover, no matter how this question is resolved, it would still create inequitable conditions for other flights at A or B that serve other airports with yet a different minimum length requirement.

A second alternative is to refrain from changing the series length requirement in Article 2(k) of the regulation, but instead assign to and enforce strict priority for longer series during the slot allocation process⁴³, thus reducing the likelihood of short series “blocking” longer ones.

In any event, neither the airport-specific minimum length requirement nor the assignment of priority to longer series would solve the problem of existing short-length series that enjoy historical precedence and may already be occupying slots at peak times of the day or peak parts of the season.

In conclusion, adoption of Article 2(13) of the 2011 Proposal would seem to merit favorable consideration. However, its impact will be limited, at least initially, by the problems identified above.

2.3.6 Hedging Against Uncertainty Regarding Slot Use

§2.22. A possibility that may seem speculative, but deserves further consideration is the use by coordinators of “slot overbooking” during the initial stage of the allocation process. If executed carefully, this approach may increase the utilization of capacity at many Level 3 airports.

The practice of overbooking is widely used in the travel industry, especially by airlines and hotels. Essentially, the practice consists of accepting more bookings than the capacity (seats, rooms, other) available, with the expectation that the number of these bookings that will eventually be cancelled (or will become “no shows”) will be sufficiently large to avoid a capacity shortfall at the time the bookings must actually be served. The success of the practice depends critically on the reliability and validity of the data (current and historical) on which it relies and on the quality of the statistical and optimization models it employs. The performance of such models has improved greatly over the years.

Nothing in the Regulation precludes the possibility of overbooking during the early planning stages for each season at Level 3 airports. Thus, coordinators could conceivably overbook during the initial slot allocation step that terminates on the

⁴³ Some of the heuristic algorithms in the software currently in use by coordinators apparently adopt this logic.

SAL Deadline, as long as they can anticipate with high statistical confidence that, on HBD, the resulting schedule of operations and traffic loads throughout the season will not violate any coordination parameters. A conservative approach in this respect would initially allocate slots to airlines in numbers that exceed the coordination parameters by only a small percentage, which would depend on the demand characteristics and historical experience of the airport where it were applied. This would ensure that, after some of the series were returned on SRD (and some individual slots cancelled) in accordance with existing statistical evidence, the probability of violating the coordination parameters would be very small, and that, should such violations actually occur, they could be fixed with minor scheduling adjustments. The difficulty of applying this approach depends, among others, on the number and nature of the coordination parameters at the airport: for example, the more fine-grained these parameters (e.g., separate limits on the number of arrivals and departures per 10 minute period) the more difficult the application.

This approach would not offer any benefits (and could not be applied) at such airports as AMS or LHR, where the demand for slots exceeds the declared capacity of the airport. At such “super-congested” airports, most (or all) allocated series that are returned by SRD (or any individual slots that are cancelled before HBD) can typically be replaced by waitlisted requests. Thus, little available capacity goes unused.

But in the majority of Level 3 airports, where some “slack” exists, at least in certain hours and days, between capacity and demand, a carefully and conservatively designed overbooking approach during the initial slot allocation step may help reduce the amount of unused capacity during the season.

Addendum 2.4: One of the features of the latest (10th) Edition of the WSG is the special attention it places on *slot monitoring*, a topic to which it devotes a new Chapter 9. Slot monitoring is defined as consisting of two phases: a pre-operation analysis “that will help identify and prevent potential slot misuse prior to the day of operation”; and a post-operation analysis to “determine whether misuse of slots has occurred and whether airlines achieve historic precedence for the following equivalent season”. The increased emphasis on preventing slot misuse and taking enforcement actions when such misuse occurs [Paragraph 9.4.4.2 of 10th Edition

(IATA 2019b)] is consistent with and complements the other measures described in this Section (§2.13 - §2.22) for reducing the number of allocated slots that are not used. We understand that significant differences exist across coordinators with respect to their current practices regarding (i) withdrawal of historic precedence when a series does not meet the “use-it-or-lose-it” threshold and (ii) penalties for slot misuse, when it occurs.

2.4 Technical Support for Coordinators and for Evaluating Potential Changes to the Slot Allocation Process

§2.23. Recent and ongoing academic research has led to the development of powerful mathematical optimization models that can provide valuable support for coordinators in addressing some of the **technical** complexities described in Section 2.1. These models aim to support the Initial Slot Allocation (SAL) step of the process by computing SALs that are fully compliant with all coordination parameters, as well as with the priorities of the different categories of series requests and with the schedule regularity constraints.

A very important side-benefit from this technical development is that these same mathematical optimization models can be valuable assets for policy-makers and regulators, as well. The models may be used to assess the impact of many proposed changes to Regulation 95/93 (or to the WSG). This is particularly true of changes aimed at: introducing more flexibility in some of the coordination rules; increasing or decreasing the minimum required length of a slot series; revising the relative priorities of the different categories of slot requests; and introducing certain types of additional criteria when allocating airport slots.

§2.24. Until a few years ago, the problem of determining Initial Slot Allocations, in response to the requests from airlines prior to each Summer or Winter season at busy Level 3 airports, was considered too complex computationally to solve through optimization algorithms. But, beginning with a first academic paper published in 2012, excellent progress has been made in this direction⁴⁴. As of 2019, computational experiments have shown that state-of-the-art optimization models are capable of

⁴⁴ While significant research on the subject had been conducted earlier (e.g., in Germany), Zografos et al (2012) is the academic paper that set the stage for these recent developments by formulating, for the first time, a nearly complete version of the SAL as a mathematical optimization problem. The optimization model that this paper describes could compute SALs for modest size airports (e.g., 5 million passengers per year). In another paper, Zografos et al (2017) provide a good review of advances up to 2016. Much further progress has been achieved since then.

computing SAL solutions at even the busiest Level 3 airports, such as Amsterdam, Frankfurt, London Heathrow, or Paris CDG⁴⁵.

However, these decision-support breakthroughs are very recent and the models have not yet transitioned to field use by coordinators⁴⁶. When the use in practice of these models becomes commonplace, coordinators, when given any set of airline slot series requests at the outset of a season, will be able to generate quickly good SAL solutions that comply with all technical requirements and constraints, as noted above, and then make changes, as necessary to account for any “additional criteria”. In fact, the existing models are already able, if desired by the coordinator, to consider many types of additional criteria, such as: size of aircraft to be used; length of the series; preference for service to certain markets; international vs. domestic service; etc. Equally important, coordinators may also modify the inputs to the model [or the priority rules of the process or the allocation criteria – see also Fairbrother et al (2018)] to observe how the resulting slot allocations would change in response.

Finally, another advantage of the proposed optimization models is that they can help ensure consistency, fairness, and traceability of the decision making process. This is in line with the ICAO call for a process that ensures “transparency, certainty, consistency, fairness and non-discrimination, as well as remaining globally harmonized” (ICAO, 2016).

§2.25. [*Note to the reader: This paragraph can be skipped as it contains only technical details.*] It is quite simple to explain the computational challenge that the SAL problem poses. As already noted in Section 2.1, the schedule regularity constraints are a key contributor to the problem’s complexity. To see why, consider the case of an airline that requests slots for scheduling a flight into and out of a Level 3 airport

⁴⁵ See Ribeiro et al (2018), and, especially, Ribeiro et al (2019a).

⁴⁶ A detailed field test will be performed by one of the European national coordinators during 2019.

on *every day*⁴⁷ of S19, with requested aircraft arrival at 10:00 and departure at 11:00. In order to allocate slots to this request, the coordinator must examine ***all 210 days*** of the S19 season ***simultaneously*** to ascertain that an appropriate pair of slots (as close as possible to 10:00 and 11:00 as possible and separated by 60 minutes) is available on ***all days*** of the season. This is because the schedule regularity constraints require that the same time (or approximately the same time by some interpretations) be assigned to the arrival and departure of the aircraft on all days of the season. Thus, instead of allocating slots one-day-at-a-time, the schedule regularity constraints make it necessary to allocate slots, all-at-once, on all 210 days, i.e., to **consider all 210 days simultaneously**.

As a result, the size of the allocation problem increases immensely. Consider a medium-to-large Level 3 airport in the EU that operates for 18 hours a day (with a curfew due to noise considerations during the remaining hours). This means there are 216 (=12x18) possible 5-minute periods per day at this airport, or 45,360 (=216x210) such periods in S19 during which arrivals and departures can be scheduled. At the same time, the number of slots requested for S19 by the airlines at such an airport could be of the order of 150,000 (and can be more than 300,000 at the busiest airports). This means that the slot allocation problem at this particular airport comes down, in rough terms, to finding the best way to distribute 150,000 “balls” (i.e., requests for slots, each request with different preferences) among the 45,360 “boxes” available to accept them (with each box having its own capacity constraints, i.e., its own coordination parameters).

The resulting combinatorial problem is so large as to have been considered computationally intractable until very recently.

In parallel, the proliferation of coordination parameters (§2.2) now often requires that the dependencies among the number of aircraft movements (on the runways), the number of stationed aircraft (aprons and stands) and the number of

⁴⁷ Note that this airline would have to file requests for 7 slot series (one for all Mondays, another for all Tuesdays, etc.), with each series requesting a pair of slots (arrival slot at 10:00, departure slot at 11:00) for the 30-week period of March 31 – October 26, 2019.

passengers (terminal buildings) be taken into account. This means that the SAL problem must also be solved *simultaneously for all elements of the airport* (runway system, aprons/stands, terminal building), rather than one element at a time. This increases further the problem's combinatorial complexity.

Chapter 3. Policy Issues

3.1 New Entrants

§3.1. One of the most persistent criticisms of Regulation 95/93 concerns its treatment of “new entrants”. To encourage competition and to facilitate access to Level 3 airports by more airlines, the Regulation stipulates that up to 50% of the slots in the “slot pool” in each season must be allocated to new entrants (NE henceforth), if there is sufficient NE demand [Article 10(6)]. The slot pool is the set of slots that remain open after requests for historic (H) and change-to-historic (CH) slots have been processed.

The most fundamental criticism on the NE front comes down to the observation that the Regulation has been largely ineffective in enabling potential competitors to challenge dominant incumbents for a significant share of traffic at individual airports, especially at the most congested ones. The current definition of NEs and the current slot allocation rules facilitate entry only at a minimal level. Carriers that originally gained access under the NE designation typically lack scale at major Level 3 airports, as they cannot obtain large “blocks of slots”⁴⁸ and develop a “critical mass” of operations that would make it possible for them to compete effectively⁴⁹ ⁵⁰. The net effect of the Regulation has thus mostly been to create an environment in which most major Level 3 airports are dominated by a small number (typically one to three) of incumbents with large shares of slots, while numerous other carriers are each operating a small number (typically just one or two) of daily rotations (i.e., pairs of slots – an arrival followed by a departure) with each of these

⁴⁸ The meaning of “large” in this context depends on the circumstances, including the type of traffic that the subject carrier is competing for.

⁴⁹ This is in sharp contrast to the situation in the United States, where low-cost and “ultra-low-cost” carriers have generally been able to establish a strong presence at even the busiest and most congested airports, driving down airfares to the benefit of consumers – a phenomenon known as “the Southwest effect”, in reference to Southwest Airlines, the best known and largest low cost carrier in the US.

⁵⁰ This is a problem that has also motivated some of the proposals for holding auctions of blocks of slots under certain circumstances (Sections 3.3 and 3.4).

latter carriers typically serving different markets from the others. To put it differently, **the net effect of the Regulation concerning NEs is to distribute a few slots each to a large number of carriers, instead of giving to one or more strong carriers opportunities to obtain “portfolios” of slots that are sufficiently numerous and well-timed to enable them to compete effectively against major incumbents.**

§3.2. To address, to some extent, this critical issue, Regulation 95/93 could be amended in two ways:

- (1) Modify the definition of “new entrant” to make it less restrictive; and**
- (2) Upgrade the priority assigned to NE requests during the slot allocation process.**

Changes (1) and (2) are complementary and synergistic, but each can also stand (and each makes sense) by itself. These two potential changes are discussed separately next.

Definition of “new entrant”

§3.3. Regarding item (1), the current definition of “new entrant” in Article 2(b) of Regulation 95/93 states:

“ ‘New entrant’ shall mean:

(i) an air carrier requesting, as part of a series of slots, a slot at an airport on any day, where, if the carrier’s request were accepted, it would in total hold fewer than five slots at that airport on that day, or

(ii) an air carrier requesting a series of slots for a non-stop scheduled passenger service between two Community airports where at most two other air carriers operate the same non-stop scheduled service between these airports or airport systems on that day, where, if the air carrier’s request were accepted, the air carrier would nonetheless hold fewer than five slots at that airport on that day for that non-stop service, or

(iii) an air carrier requesting a series of slots at an airport for a non-stop scheduled passenger service between that airport and a regional airport where no other air carrier operates a direct scheduled passenger service between these airports or airport systems on that day, where, if the air carrier’s request were accepted, the air

carrier would nonetheless hold fewer than five slots at that airport on that day for that nonstop service.

An air carrier holding more than 5% of the total slots available on the day in question at a particular airport, or more than 4% of the total slots available on the day in question in an airport system of which that airport forms part, shall not be considered as a new entrant at that airport.”

Article 8(6) further stipulates that *“among requests from new entrants preference shall be given to air carriers qualifying for new entrant status under both Article 2(b) (i) and (ii) or Article 2(b) (i) and (iii)”*.

In Article 10(7) the Regulation further states: *“A new entrant which has been offered a series of slots within one hour before or after the time requested but has not accepted this offer shall not retain the new entrant status for that scheduling period.”*

Finally, Article 8(3) prohibits (with some exceptions) *“for a period of two equivalent seasons” the transfer, exchange or change of route of slots allocated to a new entrant*. As will be discussed later, this provision has acted as an important disincentive for the submission of requests for new entrant slots.

§3.4. The definition of “new entrant” in Article 2(b) has several implications. First, all airlines that are *not* Community carriers⁵¹ can qualify for NE status *only* under Article 2(b)(i)⁵². This means that non-Community carriers that request slots as NEs are

⁵¹ A Community carrier is an airline with an operating license issued by an EU Member State in accordance with Regulation (EC) No 1008/2008 of the European Parliament and of the Council. EU Member States and/or nationals of Member States must own more than 50% of the carrier and effectively control it.

⁵² Article 2(b)(i) is identical to the definition of NE in the WSG, which limits the designation of NE to “an airline requesting a series of slots at an airport on any day where, if the airline’s request were accepted, it would hold fewer than 5 slots at that airport on that day” [IATA, 2019]. Articles 2(b)(ii) and 2(b)(iii), as well as the 5% and 4% limits set at the end of Article 2(b) are specific to Regulation 95/93.

limited to slots that would provide a maximum of two rotations in a day⁵³. Only Community carriers may currently qualify under Articles 2(b)(ii) and 2(b)(iii) because only such carriers may provide service “between two Community airports” [Article 2(b)(ii)] or “between that airport and a regional airport” [Article 2(b)(iii)]⁵⁴. In fact, provision 2(b)(iii) is unnecessary: it is always superseded by 2(b)(ii), because the regional airport will be an airport in the EU, in any case.

Second, not only NEs but also incumbent airlines already holding a few slots at Level 3 airports also suffer the consequences of the restrictive definition of NE. If they have already established even a very limited presence at the airport, they are disqualified from seeking slots under NE status. To obtain additional slots, they must submit requests under the “Other” designation, i.e., in the class with the lowest priority and in competition with all other non-new-entrant carriers that are requesting additional slots.

Third, Articles 2(b)(ii) and 2(b)(iii) “relax” significantly the restrictions of Article 2(b)(i) in the case of the few Community carriers whose business plan may include the provision of air service between underserved pairs of EU airports or between Level 3 airports and regional airports within the EU. Some Community carriers have indeed benefitted from this relaxation. For instance, Ryanair (a Community carrier) has been able to obtain roughly 50 slots per day in Frankfurt (as of 2018), following the opening of the new runway there in late 2011 and the consequent increase in the airport’s declared capacity.

⁵³ The definition of NE in the WSG [same as Article 2(b)(i) in Reg. 95/93] probably dates back to the pre-deregulation days, when government-owned national “flag carriers” offered one or two flights per day between the main airport(s) of their State and the main airport(s) of another State, in accordance with the 3rd and 4th Freedoms of the Air. The notion that any airline might develop a sizable “hubbing” operation at an airport outside its own State hardly existed at the time. Only “flag carriers” operated such hubs within their own States.

⁵⁴ This may change if, in the future, some non-Community carriers are granted Seventh Freedom rights for passenger services within the EU – a rather remote prospect at this time.

§3.5. The 2011 Proposal of the Commission offers a more expansive definition of NE in its Article 2(2):

“ ‘New entrant’ shall mean:

(a) an air carrier requesting, as part of a series of slots, a slot at an airport on any day, where, if the carrier's request were accepted, it would in total hold fewer than five slots at that airport on that day; or

*(b) an air carrier requesting a series of slots for a non-stop scheduled passenger service between two European Union airports, where at most two other air carriers operate the same non-stop scheduled service between those airports on that day, and where, if the air carrier's request were accepted, the air carrier would nonetheless hold fewer than **nine** slots at that airport on that day **for that non-stop service.***

*An air carrier which **together with its parent company, its own subsidiaries or the subsidiaries of its parent company**, holds more than **10%** of the total slots allocated on the day in question at a particular airport shall not be considered as a new entrant at that airport;*

An air carrier which transferred ... slots obtained as a new entrant to another air carrier in the same airport in order to be able to invoke again the status of a new entrant at that airport, shall not be considered as a new entrant at that airport” [bold added to highlight significant proposed changes to the current definition].

§3.6. The revised definition in the 2011 Proposal marks a cautious step forward in relaxing restrictions on NE designation. It makes allowance for up to 4 rotations (an arrival followed by a departure) per day by qualified carriers for *each* under-served pair of EU airports. At the aggregate level, it also replaces the existing limit of 5% of the total slots at any particular airport with a limit of 10% for the requesting airline together with the entire parent group it may be part of. This would mean up to as many as 160 slots in a day at the EU airports with the largest number of slots (e.g., Frankfurt, Amsterdam, or Paris CDG) and about half that number at more typical, high-volume airports (e.g., Dublin, Lisbon). It therefore would remove, for most practical purposes, any restrictions on Community carriers wishing to obtain a sizable block of slots through the NE designation in order to offer service on under-served routes (at most two other carriers) to/from other EU airports.

A case can also be made for the more significant step of **changing Article 2(b)(i) of the current definition of “new entrant” in Regulation 95/93 to increase the number of slots that NEs may obtain on the same day**. Currently, Article 2(b)(i) specifies a limit of “*fewer than 5 slots at that airport on that day*” (see §3.3 above). The rationale for this upper limit of 4 slots in a day is not clear and, as noted earlier in Footnote 54, may well be a remnant of a no-longer existing air transport environment. For instance, changing the NE requirement in Article 2(b)(i) to “**fewer than 9 slots**” (a change that would also bring it in line with Article 2(2)(b) of the 2011 Proposal) could make entry as new entrant a much more attractive proposition to airlines that could challenge the *status quo* and compete seriously with dominant incumbents at large Level 3 airports. These potential competitors would probably be legacy carriers that are members of alliances or large low-cost carriers. Such carriers would typically not be interested in just 2 slot rotations per day [current Article 2(b)(i)] or in serving underserved markets between two Community airports. However, an obstacle to adopting any such change to the “fewer than 5 slots” requirement of Article 2(b)(i) of the Regulation is the fact that **this would require either a break with the WSG or an agreement on a global scale to such a change**. As has been noted already, the full definition of “new entrant” in the WSG [(Chapter 10 of IATA (2019))] is identical to Article 2(b)(i) of the Regulation.

Addendum 3.1: As noted in Addendum 1.3, the 10th edition of the WSG (“effective August 1, 2019”) has increased the maximum number of slots that a new entrant can obtain to “fewer than 7” (i.e., to a maximum of 6) from the previous limit of “fewer than 5”. Per the discussion in above §3.3 – §3.6, this is a step in the right direction and consistent with the argument made in §3.6. We have no information on the rationale for selecting the particular limit of a maximum of 6 slots (or on whether the change was based on a quantitative study). Regulation 95/93 continues, at least for now, to use the “fewer than 5” limit in the relevant part [Article 2(b)(i)] of the Regulation.

§3.7. Some concerns may also be noted regarding the revised definition of NEs in the 2011 Proposal: First, the 10% limit may be unrealistically high and may create false

expectations. It is unlikely that, in practice, any of the seriously congested Level 3 airports will have a slot pool sufficiently large to accommodate any single new entrant seeking as many as 10% of the total number of daily slots. This may be feasible at only a small subset of Level 3 airports. In addition, too high a limit may lead to instances in which NEs request an unrealistically high number of slots and are eventually unable to put them to good use.

Second, only a very few airlines may be able to benefit from Article 2(2)(b) in the 2011 Proposal. These, as already noted, would be sizable Community carriers whose development strategy emphasizes intra-EU service on routes previously served by only two or fewer airlines.

Article 2(2)(b) of the 2011 Proposal might also come under criticism as having a “protectionist bent”: non-Community carriers would not, under current Air Service Agreements, be able to benefit from it and would continue to be subject to the severe limit of a total of 4 slots in a day, which is imposed by 2(2)(a).

Finally, although Article 2(2) of the 2011 Proposal is clear in stating that the 10% limit applies to “an air carrier together with its parent company, its own subsidiaries or the subsidiaries of its parent company”, it is silent on other situations that may come up in practice. For instance, alliance members and joint venture partners may also have to be taken into account in determining compliance with the 10% (or any other) limit, e.g., by specifying a different, higher threshold for alliances. Or, if an airline applying for NE has already leased slots to/from another carrier, these leased slots may be counted against the limit. These are examples of points that require attention and further clarification.

Upgrading the priority of new entrant requests

§3.8. Incumbent airlines at Level 3 airports have the right to request changes to their historic slots. Changes may involve moving the slot to a different time (“re-timing”) from the one it occupied in the previous equivalent season, or using the slot to serve a different market (“re-purposing”), or using a different aircraft type, or some combination thereof. These changes can be proposed in the form of “change-to-historic” (CH) requests and must be approved by the coordinator before they can go into effect. For slot allocation purposes, re-timing is by far the most consequential of

these changes, as it may require a (possibly extensive) “re-shuffling” of other slot assignments, i.e., have a “domino effect”.

§3.9. To date, CH requests have been accorded priority over requests by new entrant (NE) carriers or other aircraft operators, **thus offering incumbent carriers an additional competitive advantage over NEs at Level 3 airports**. This is a long-standing practice that precedes the deregulation/liberalization of the airline industry in the EU and whose implications for competition are often insufficiently appreciated. It gives incumbent airlines, especially dominant carriers holding large portfolios of slots at Level 3 airports, priority in optimizing their portfolios and adjusting them to developments over time. For example, a slot series for a mid-morning domestic departure with a narrow-body aircraft may be transformed (through a CH request) into an early afternoon departure for a North Atlantic flight by a wide-body.

Paragraph 8.3.3.1 of the WSG stipulates (for application at a global level): *“Changes to a historic slot should have priority over new requests for the same slot within the capacity available”* [IATA, 2019]. Regulation 95/93, essentially echoes the WSG, while also aiming to place some restrictions on slot re-timing:

“Re-timing of series of slots before the allocation of the remaining slots from the pool referred to in Article 10 to the other applicant air carriers shall be accepted only for operational reasons or if slot timings of applicant air carriers would be improved in relation to the timings initially requested” [Article 8(4)⁵⁵].

The restrictions on the re-timing of slot series in the above-cited text are stated in terms so broad as to have virtually no impact on the practice of prioritizing CH requests over NE requests. This is because, under most reasonable interpretations, the stated conditions (“for operational reasons or if slot timings of

⁵⁵ The cited text of Article 8(4) of Regulation 95/93 is an amendment adopted in 2004 (Regulation 793/2004). The original (1993) version of the Regulation simply repeated the priorities stipulated by the WSG. After stating that slots enjoying historical precedence are entitled “to claim the same slot in the next equivalent scheduling period”, the original version of Regulation 95/93 stated [Article 8(1(c))]: *“The coordinator shall also take into account additional priority rules established by the air carrier industry...”*, thus assigning, by default, priority to CH over NE requests.

applicant air carriers would be improved in relation to the timings initially requested”) are satisfied in practically all cases in which an air carrier requests a re-timing of a historic slot: the carrier would not have requested the slot’s re-timing, unless the change would improve the carrier’s operations, in the first place.

An example of how Article 8(4) is typically interpreted by coordinators can be found in paragraph 4.2 of the “*Guideline for the allocation of scarce slots at coordinated German Airports*” (Fluko, 2011), issued by the agency that acts as the coordinator and facilitator of German airports:

“ ... pursuant to Article 8 Paragraph 4a Regulation (EEC) No. 95/93, all airlines that want to utilise their historic rights for the rescheduling of these slots, shall first be allocated slots applied for from the previous capacity⁵⁶, provided that these are available. The prerequisite for this shall be that:

- the airline can thus better itself in comparison with the original application, or*
- can cite operating reasons. Operating reasons are either in connection with the change of an aircraft employed or of the route served.”*

The next paragraph (4.3) in the cited document (Fluko, 2011) then confirms the precedence of CH requests over NE requests: “*After the previous capacities from the preceding equivalent scheduling period have been allocated again on the basis of historic rights **or rights to rescheduling**, ... the remaining capacities ... shall form the slot pool*” (i.e., for allocation to new entrants and to other slot applicants) [**bold added**].

§3.10. The 2011 Proposal does not give any consideration to changing the prioritization of slots – CH requests would still retain priority over NE and other requests, as in Regulation 95/93. The 2011 Proposal attempts, instead, to elaborate further on the conditions for the re-timing of slots and allows re-timing only for “operational reasons”. Specifically, Article 10(4) of the 2011 Proposal states:

⁵⁶ Note that, importantly, the guideline also clarifies that re-timing is limited to already existing slots (“previous capacity”); slots resulting from newly added capacity are not available for slot re-timing.

“Re-timing of series of slots before the allocation of the remaining slots from the pool referred to in Article 9 to the other applicant air carriers shall be accepted only for operational reasons such as, changes in the type of aircraft used or route operated by the air carrier. It shall not take effect until expressly confirmed by the coordinator.”

However, changes in the type of aircraft used and, especially, in the route operated (i.e., market served) are two of the three most common reasons for any significant re-timing⁵⁷ of a historic series⁵⁸. Thus, as in the case of the current version of Regulation 95/93, the restrictions on re-timing, as stated in the 2011 Proposal, are only marginally more binding than currently and may have very limited practical impact.

§3.11. Instead of attempting to limit the changes to historic slots that airlines may request, **a far more effective approach would be to simply reverse the priorities currently assigned to CH vs. NE requests.** It is, of course, reasonable that holders of historic slots be given the opportunity to “optimize” their slot portfolios by making changes to historic slots. But, given that one of the main stated objectives of Regulation 95/93 is to promote a competitive environment at Level 3 airports, it is unclear why CH requests should enjoy priority over requests by new entrants (NE) – or, for that matter, over any requests to introduce new scheduled services. As the UK’s Department of Transport has stated in its *Aviation 2050* report [UK DoT, 2018] in the context of the projected capacity expansion (third runway, etc.) of London Heathrow⁵⁹: **“if incumbent airlines are given preference to re-time their existing slots, this offers them a competitive advantage over those seeking newly created slots.”**

⁵⁷ By “significant re-timing” we mean a change of more than 20 – 30 minutes in the timing of a slot.

⁵⁸ A third reason is that an airline may wish to move a flight to a new time for commercial reasons, without change in aircraft or route.

⁵⁹ Indeed, the UK DoT has indicated its intent to implement relevant changes to the slot allocation system and invited industry views on the issue of *“whether airlines re-timing their existing slots into more desirable newly-created slots should be permitted and, if so, whether they should be given priority over new slots that are allocated”* [UK DoT, 2018].

Airport	Change Requested	Airport	Change Requested
Barcelona (S18)	61.5%	London Gatwick (S18)	56.54%
Berlin Schonefeld (S16)	75.4%	London Heathrow (S18)	61.81%
Berlin Tegel (S16)	56.8%	Madrid (S18)	61.1%
Dublin (S18)	36.9%	Munich (S16)	38.2%
Dusseldorf (S16)	68.0%	Palma di Majorca (S18)	53.3%
Frankfurt (S16)	26.5%	Stuttgart (S16)	53.8%
Geneva (S17)	23.6%	Vienna (S17)	23.2%
(S18)	19.0%	(S18)	31.3%
(S19)	14.6%	Zurich (S17)	32.0%
Hamburg (S16)	59.0%	(S18)	18.7%
Lisbon (S14)	55.3%	(S19)	21.6%
(S15)	37.6%		

Table 3.1: Percent of historic slots for which a change was requested at some of the busiest Level 3 airports in the EU; a change may involve re-timing of the slot or change of market served or change of aircraft or any combination thereof. (Source: Relevant coordinators)

<u>A/pt</u>	<u>Season</u>	<u>% NE Requests</u>	<u>A/pt</u>	<u>Season</u>	<u>% NE Requests</u>	<u>A/pt</u>	<u>Season</u>	<u>% NE Requests</u>
BCN	S16	1.2%	MAD	S16	1.4%	PMI	S18	2.3%
BCN	S17	1.1%	MAD	S17	0.5%	STR	S19	1.2%
BCN	S18	1.0%	MAD	S18	0.6%	SXF	S19	0.2%
DUS	S19	0.6%	MUC	S19	0.9%	TXL	S19	0.9%
FRA	S19	0.6%	OPO	S14	1.7%	VIE	S17	0.4%
HAM	S19	0.8%	PMI	S16	1.9%	VIE	S18	0.6%
LIS	S15	0.9%	PMI	S17	1.9%	VIE	S19	0.8%

Table 3.2: Requests for NE slots as percent of the total number of slots requested at a sample of EU Level 3 airports. (Source: Relevant coordinators)

<u>Airport</u>	<u>Eligible for NE</u>	<u>Airport</u>	<u>Eligible for NE</u>	<u>Airport</u>	<u>Eligible for NE</u>
DUS	7.1%	MUC	5.1%	SXF	24.8%
FRA	2.7%	STR	26.3%	TXL	5.8%

Table 3.3: Percent of requested slots that fulfilled the requirements for NE designation (but may not have been requested under a “NE” designation) at six German Level 3 airports in S16. (Source: FLUKO)

§3.12. Available data show that incumbent carriers at Level 3 airports request changes to their historic slots with high frequency. Table 3.1 indicates that, at the major European airports shown, incumbents requested changes to historic slots (on consecutive equivalent seasons) at a rate of the order of 50% of their historic slots. In the case of the busiest airports this may mean that requests for change (CH) could be submitted for more than 100,000 historic slots in a single season! We have obtained very limited data regarding the share of these changes that include re-timing, but it seems quite certain that they account for a large percentage – possibly of the order of 50% or more – of all CH requests⁶⁰. As will be seen in the next paragraph, this means that they exceed by a wide margin the number of slots requested by NEs.

§3.13. The number of slots typically requested under the NE designation at EU Level 3 airports currently represents a (perhaps surprisingly) small fraction of the total number of slots requested. Table 3.2 shows that, for a sample of 13 airports in 25 recent seasons, they amounted to only about 1% of the slots requested, except for the highly seasonal airports of Palma di Mallorca (PMI) and Porto (OPO) where they were closer to 2%.

Several factors contribute to the current paucity of CH requests at Level 3 airports (Table 3.2). The two most obvious are (i) the scarcity of “good” slots (i.e., slots at the times most suitable for a planned new service) at the most congested airports and (ii) the fact that NEs may request, by definition, only a small number of slots (§3.3), in the first place.

A third contributor that may be playing an important role is Article 8(3) of Regulation 95/93 which, as noted in §3.3, prohibits (with certain exceptions) the transfer, exchange, or change of route of slots allocated to a new entrant for a period of two equivalent seasons. The motivation for this “2-season requirement” is obviously to discourage speculative behavior by carriers and to avoid resulting schedule fragmentation. The argument is that it often takes at least two seasons for a

⁶⁰ In S18, 50.3% of CH slot requests at LHR included a request for re-timing. Corresponding percentages for a few other airports were: LIS 85% (S15), Porto (OPO) 81% (S14), Guarulhos (GRU) 75% (W18/19). (GRU is the busiest airport in South America, with 43 million passengers in 2018.)

new entrant to establish a competitive foothold and develop a viable operation⁶¹. However, there is much evidence that the 2-season requirement acts as a strong disincentive, with some airlines deciding not to submit requests under the NE designation, even if they are eligible for such designation. This is particularly true at those Level 3 airports where the number of “open” slots may still be reasonably large. At these airports an airline may prefer to submit a request under the “Other” (O) designation (instead of the NE designation), knowing that it will be able to receive reasonably good slots anyway without the obligation to utilize the slots for two equivalent seasons before it can transfer them or use them differently.

This point is illustrated by the following example: For S16, Fluko, the German airport coordination agency, determined independently the percent of requested slots (Table 3.3) that would have fulfilled the NE requirements at the six (at the time) Level 3 airports in Germany, had the submitting airlines wished to use that designation. (For example, according to Table 3.3, 7.1% of the requested slots at DUS for S16 were *eligible* for NE request designation, but were not necessarily requested as such.) It can be seen, by comparison to Table 3.2, that the percentage of *eligible* requested slots at each of these six airports (Table 3.3) was *much higher* than the percentage of *actually* submitted NE slot requests (in S19).

It is therefore probable that many airlines, especially at the less congested airports, do not perceive the advantages currently offered to NEs (priority access to 50% of slots remaining in the slot pool) as sufficient for submitting requests as NEs. It has also been suggested that some airlines that already hold four slots in a day at a Level 3 airport (i.e., have reached their limit under Article 2(b)(i) of Regulation 95/93) do not investigate whether they may be eligible for more NE slots under the provisions of Articles 2(b)(ii) and 2(b)(iii) that refer to flights in under-served routes within the EU or to regional airports.

⁶¹ The “2-season requirement”, in combination with the current definition of “new entrant” in Article 2(b), invites some “gaming”. For instance, a NE may obtain several slots under Article 2(b)(ii) – to serve under-served routes between two Community airports – and, after “two equivalent seasons”, re-deploy these slots (through a CH request) to serve more profitable routes that are already served by 3 or more other airlines.

§3.14. A change in the Regulation that would *reverse priorities* by according precedence to new entrant (NE) over change-to-historic (CH) requests would offer new entrants enhanced opportunities to obtain access to the slots that they are most interested in.

Such a reversal of priorities can be implemented through a simple procedural change without affecting any of the other rules and priorities of the existing slot allocation process. The following provides a summary description of this alternative procedure:

Denote with H, CH, NE and O, respectively, requests submitted under the categories of historic, change-to-historic, new entrant, and “other”. The H and CH requests enjoy historic rights, having presumably satisfied the use threshold (currently 80%) during the previous equivalent Summer or Winter season. The procedure would then work as follows:

Step 1: Allocate slots to all requests that have historic rights, **whether H or CH**, as if they have all been submitted as H requests. (In other words, all requests that have been submitted under the H or the CH designations are treated in this step as H requests and are assigned to the historic slots they are entitled to.)

Step 2: Allocate, as at present, up to 50% of the slots in the slot pool (i.e., in the set of slots that are not designated as historic) to NE requests (if there is enough demand by NEs). (If NE requests exceed 50% of the slot pool, those NE requests that cannot be assigned to a slot in this step may be reconsidered in Step 4.)

Step 3: Consider the slot assignments to H requests (made in Step 1) and to NE requests (made in Step 2) as fixed; process CH requests next, i.e., attempt to satisfy the requested changes as best as possible, using the slots that are still available after the H and NE slot requests have been processed.

Step 4: Use any remaining slots (i.e., those not assigned in Steps 1, 2, and 3) to accommodate any remaining requests (i.e., all O requests and any NE requests not accommodated in Step 3); some requests may have to be rejected, as at present, if the remaining slots are fewer than the remaining requests.

Note that this procedure: **(i) reverses the order of Steps 2 and 3 of the existing allocation procedure, which accommodates CH requests before**

considering NE requests; (ii) ensures that, in the worst case, CH requests that cannot be accommodated will revert to their historic slots, just like under the existing procedure; and (iii) may affect only CH requests that include re-timing (i.e., the reversal of priorities does not have any impact on requests for changes that are limited solely to aircraft type and/or to the origin/destination of the flight served by the slot).

§3.15. New entrants will obtain two significant advantages through the procedure described in the previous paragraph: First, and obviously, they will have better access to “good” slots (i.e., to slots at more desirable times), as (i) only the slots occupied by historic series will be “out of reach” when they submit their requests and (ii) only H requests (i.e., requests by incumbent airlines which do not wish to re-time their historic slots) will enjoy priority over NE requests. Second, and equally important, new entrants will be able to identify **in advance** attractive “open” slots (i.e., slots to which incumbents have no historic rights) and submit requests for them with **full certainty** that their requests will enjoy priority for these slots over those of incumbents. This is in contrast to the way the allocation process works today: under current practice, a new entrant may submit a request for a slot that was open in the previous equivalent season, but may then discover that the slot has been allocated for the upcoming season to a CH request, i.e., to an incumbent carrier that has also targeted the same slot. In fact, under the existing system, incumbents may “game the system” by requesting changes to the timing of their historic slots designed to preempt anticipated slot requests for new services by NE and other airlines. By contrast, with the proposed reversed priority, **all NE requests that target an open slot are guaranteed to be successful**, as long as no other new entrants request the very same slot. Overall, these dual advantages **may stimulate additional and bolder demands for slots by carriers that qualify for NE designation**.

It is also noteworthy that incumbent carriers with a small number of slots at Level 3 airports could also benefit significantly from the proposed combination of (i) an increase in the number of slots that can be allotted per day to a new entrant and (ii) the reversal of CH vs. NE priorities. First, such carriers may be able to qualify again as NEs under (i), i.e., if the maximum daily allotment of slots per NE is

increased. And, second, the requests for additional slots submitted by these carriers (now newly designated again as NEs) would, under (ii), enjoy priority over CH requests by larger incumbents.

§3.16. While reversing the priorities of NE vs. CH requests will benefit NE requests significantly, **the negative impact on CH requests will probably be very limited.** This is because, as pointed out in §3.12 and §3.13, the number of CH requests involving re-timing is in practice much larger than the number of NE requests. Thus, while the benefits to NE requests, as measured by the average reduction in NE slot displacement, will typically be very significant, the corresponding increase in the average slot displacement of CH requests – caused by the higher priority assigned to (the much smaller number of) NEs – will typically be very small, often marginal⁶², as only a small number of CH requests will be affected negatively by the priority accorded to NE requests. Negative effects on CH requests (solely on those that involve re-timing) will become significant only if the reversal of NE vs. CH priorities proves successful in stimulating many more NE requests than are submitted at present (see §3.13) and thus promote a more competitive environment at Level 3 airports.

Addendum 3.2: As noted in Addendum 1.3, the 10th edition of the WSG (“effective August 1, 2019”) changed the slot allocation priority rules so that requests for changes-to-historic (CH) slots, for new entrant (NE) slots and requests for additional slots by non-new-entrant airlines (O) are considered as having equal priority. (CH requests will still retain their historic slot times, if the coordinator cannot accommodate the requested change or if the requesting airline does not accept any alternative change that the coordinator may offer.)

Per the discussion in §3.11 – §3.16 above, this change is a step in the right direction. However, in the view of this author, giving higher priority to NE requests than to CH and O requests – as recommended in §3.11 and explained in more detail

⁶² Ribeiro et al (2019b) discuss this point extensively.

in §3.14-§3.16 – would be more effective in stimulating increased demand by NEs at congested Level 3 airports and strengthening their competitive position there.

Some serious difficulties can also be anticipated in the practical application of the “equal priorities” change. It is safe to predict that the effects of the change of priorities introduced in the latest version of the WSG will depend critically on the assumptions and design of the software tools that individual coordinators use, i.e., on the way these tools process airline slot series requests. Paragraph 8.3.3.2 of the August 2019 version of the WSG states that the coordinator will treat NE, O (“non-new-entrant”) and CH requests *“holistically and fairly across the day, using primary and, if necessary, additional criteria for initial slot allocation ...”*. The key word here is “holistically”, i.e., NE, O, and CH requests would all be processed as a single “batch” and would compete for the slots available in the pool. However, existing software is not designed for such a “holistic” approach and processes different classes of requests sequentially. Moreover, the details of how exactly CH, NE and O requests will be processed holistically can make a big difference in how the slots are allocated. For example, how will the 50% of the slot pool to which NEs have “first rights” be determined? Will it simply be a set consisting of 50% of the total number of slots in the pool, or will it be 50% of the slots available in each hour (to make sure that NEs have equal access to “good” and to “bad” slots)? Will ‘additional criteria’, such as the length of a series, give a systematic advantage to one particular class of requests? (The conjecture here is that it will indeed give such an advantage to CH requests.) It will be important to track closely developments along these lines, i.e. how exactly the new priority regime will be implemented.

Summary and Conclusion

§3.17. To stimulate demand by new entrant carriers and to strengthen conditions under which new entrants and small incumbents may develop “blocks of slots” that would enable them to compete with dominant and large incumbents at Level 3 airports, consideration should be given to modifying Regulation 95/93 in two respects:

- (a) Make the definition of “new entrant” less restrictive; and

(b) Assign higher priority to new entrant requests than to requests for changes to historic slots already held by incumbent carriers.

Concerning (a), the adoption of Article 2(2) of the 2011 Proposal of the Commission, as a replacement of current Article 2(b) of the Regulation, would be a step in the right direction, despite the concerns noted in §3.7. Furthermore, consideration should be given to additional ways in which the 2011 Proposal can be improved in this respect. A change that deserves favorable consideration is an amendment to Article 2(b) of Regulation 95/93 [or Article 2(2)(a) of the 2011 Proposal] that would increase the current limit of “fewer than 5 slots”, e.g., to “fewer than 9”, which would bring it in line with Article 2(2)(b) of the 2011 Proposal. Higher limits could also be investigated. However, it should be recognized that such a change would require either a break with the WSG or an agreement on a global scale regarding the change.

With regard to (b), the 2011 Proposal is entirely silent on the possibility of reversing the current priorities of CH and NE requests. Reversing these priorities is a step that deserves consideration for possible immediate adoption. If deemed beneficial, this change would be easy to implement through a simple modification of the current allocation procedure, as described in §3.14. This change may have significant practical implications by stimulating currently lagging demand by new entrants. In combination, (a) and (b) may contribute to attracting new entrants that are capable of strengthening competition at some busy Level 3 airports.

3.2 Secondary Trading and Property Rights to Slots

§3.18. Secondary trading refers to exchanges of slots between air carriers or to transfers of slots from one air carrier to another that *include monetary compensation* (and, possibly, other considerations). Secondary trading, in all but exceptional cases, involves only slots that enjoy historical precedence.

The Commission has long struggled with the issue of whether secondary trading should be allowed at Level 3 airports across the EU. In its 2008 Communication, it provided an interpretation of Regulation 95/93, which essentially amounts to a “hands off” position summarized as follows: *“given that there is no clear and explicit prohibition [in Regulation 95/93] of such exchanges, the Commission does not intend to pursue infringement proceedings against Member States where such exchanges take place in a transparent manner, respecting all the other administrative requirements for the allocation of slots set out in the applicable legislation”* [COM(2008) 227].

Each Member State may thus adopt its own policy with regard to allowing secondary trading at its Level 3 airports. To the best of our knowledge, the United Kingdom is still the only EU Member State⁶³ that officially sanctions secondary trading⁶⁴, following a decision by the English High Court in a 1999 case involving British Airways and KLM [Haylen and Butcher, 2017; de Wit and Burghouwt, 2008]. An active secondary trading market is currently operating at London Heathrow (LHR), London Gatwick (LGW) and, more recently, at London City (LCY) and possibly other UK airports. Airport Coordination Limited (ACL), the coordinator of UK’s Level 3 airports, monitors secondary market transactions for compliance with the trading rules (e.g., the 2-season use requirement for slots allocated to NEs – Section 3.1) and approves them, as appropriate. ACL maintains a website⁶⁵ which lists all slot trades

⁶³ It is our understanding that the sanctioning of secondary trading may currently be under consideration in at least one other Member State.

⁶⁴ However, it is widely believed that some “off-the-books” trading that has included monetary payments (“fake exchanges”) has also been taking place at other EU airports for some time.

⁶⁵ See <https://www.acl-uk.org/completed-trades/>

and exchange transactions at these airports. Currently, it lists more than 500 such trades and transactions, the great majority of them at LHR and LGW, dating back to S08. Disclosure of any monetary compensation that may have been involved is not mandatory and the ACL website does not provide such information. Publicly available information about the prices paid for the slots is therefore limited and comes primarily from airline announcements and from (occasionally conflicting) reports in various industry publications and newsletters.

As available information about secondary trading is based on partial data coming largely from only two airports with special characteristics – LHR, and to a lesser extent, LGW – it is **necessary to be cautious** about interpreting the data and, even more so, about attempting to perform quantitative analyses that would predict the potential impacts of secondary trading on a wider scale. This section will therefore be limited to some general observations about such impacts and to a brief discussion of relevant policy options.

Positives and Negatives

§3.19. Secondary trading offers several potential advantages: First and foremost, it constitutes, where permitted, **the only part of the slot allocation process under Regulation 95/93 in which an economic instrument (i.e., monetary compensation) may play a role**, thus offering carriers that attach a high economic value to certain “occupied” slots a path toward acquiring these slots. Conceivably, a carrier with adequate resources could acquire through secondary trading over the years a large enough number of slots to establish itself as a major presence at a Level 3 airport, offering services to many destinations and benefitting from economies of scale and from intra-carrier flight connections.

Secondary trading also **makes explicit to incumbent carriers the opportunity costs associated with holding onto the slots in their current portfolios**. It therefore may stimulate the mobility of slots at the airports where it is allowed.

Third, it may serve to **inform government policymakers, regulatory bodies and the public at large of the economic value of slots**. Indeed, reports on

	Buyer	Seller	Daily Slots*	Total Price (x10 ⁶)	Ave. Price per Daily Slot Pair (x10 ⁶)
Feb '13	Etihad	Jet (India)	1x early am, 2x pm	\$70	\$23.3
Aug '14	Etihad	Alitalia	3x pm, 2x evening	€60	€12
Feb '15	Turkish	SAS	1x pm	\$22	\$22
Feb '15	American	SAS	1x early am	\$60	\$60
Oct '15	Delta	AF/KLM	6x am/early am	\$276	\$46
Feb '16	Oman Air	AF/KLM	1x early am	\$75	\$75
Jan '17	Delta	Omni Air	5/wk am	\$19.5	\$27.3**
Mar '17	American	SAS	1x am, 1x early pm	\$75	\$37.5

Table 3.4: Sample of slot trades in recent years at London Heathrow for which price has been disclosed [Source: Heathrow Airport Holdings].

* x = one daily pair of slots, i.e., for seven days per week (=14 slots per week) – for example, “3x” means 3 pairs of slots, each pair for seven days per week;

5/wk = five slot pairs per week, Monday – Friday (=10 slots per week)

** =19.5x(7/5)

	Before Trade	After Trade	Difference
Seats per slot	135	225	+90%
Sector length	575 km	6800 km	x 12
ASK per slot	77,625	1,734,000	x 22

Table 3.5: Impacts of slot trading, “based on a sample of LHR trades, excluding temporary lease agreements”; the size of the sample and the way of selecting it are not given. (ASK = Available Seat Kilometers.) [Source: ACL, 2016.]

the impressive prices that slots at LHR have fetched in recent years (Table 3.4) have contributed, probably more than anything else, to raising awareness of the economic importance of airport capacity in Europe. Ironically, this is actually information from an “outlier” airport (when it comes to slot valuation in monetary terms), as LHR constitutes one of the most extreme examples of slot scarcity in the world.

Finally, secondary trading, essentially by definition, will tend to **improve the alignment of the usage of slots (as operated by the slot buyers) with the commercial opportunities and advantages offered by an airport**, as the slot-purchasing carriers will seek to extract more economic value out of their newly acquired slots than the sellers previously did. For instance, at LHR, which is increasingly serving as a long-haul hub, one might expect that slots acquired through secondary trading would be mostly used for operating flights that are, on average, of longer range and performed by aircraft with higher seating capacity than the flights they replace. This conjecture seems to be borne out by the limited available information. Table 3.4⁶⁶, that lists a sample of slot trades at LHR for which the purchase price has been disclosed, suggests that the sellers of the slots⁶⁷ (Alitalia, AF/KLM, SAS) were generally airlines that offered short-haul and medium-haul flights with narrow-body aircraft between LHR and airports in Europe, whereas the buyers were long-haul operators (when it comes to flights to/from LHR) using wide-body aircraft (for flights to/from LHR). Moreover, Table 3.5, posted by ACL in 2016 “for a sample of Heathrow trades”⁶⁸, indicates that the average number of aircraft seats per traded slot increased from 135 before the trade to 255 after it, while the flight distance per traded slot rose from 575 km to 6800 km, respectively [p. 26 in ACL (2016)].

On the negative side, *air services to smaller and regional communities may be reduced* as a result of such transactions, thus having an adverse impact on local/domestic connectivity and on the distribution of the benefits of aviation

⁶⁶ It is not known how representative the sample shown in Tables 3.4 is.

⁶⁷ The other two sellers were a financially troubled, at the time, Indian airline (Jet) and a US charter carrier (Omni).

⁶⁸ No information is given about the sample’s size and the relevant selection criteria.

services. More generally, what represents “good value” to the buyer of a slot (e.g., a large incumbent network carrier) may not align with the interests of any number of other stakeholders (local or regional community, airport operator, small new entrants, etc.).

§3.20. The importance of the role of secondary trading at “super-congested” airports (i.e., airports where the availability of “open” slots is very limited – see Section 3.3) is illustrated in Figure 3.1, which summarizes slot mobility at LHR⁶⁹ between 2000 and 2016⁷⁰. In the early years of the period (up to 2007) the slot pool (i.e., the set of slots not already assigned to historic and change-to-historic requests) was the source of the majority of newly acquired slots (“pool allocation”). But the slot pool “dried up” after 2007 and slot transfers, including slots acquired in the secondary trading market, became the primary means by which airlines could access slots. Note that the vertical axis shows “slots per week” (one slot rotation per day translates into 14 slots per week). Thus, the roughly 250 slots per week that were either allocated through the slot pool or transferred during each of 2014, 2015 and 2016, as shown in Figure 3.1, represent only about 2.6% of the “slot capacity” of LHR, which currently amounts to roughly 9600 slots per week. This is **a striking indication of the lack of slot mobility** at the airport, despite the operation of a secondary market there.

§3.21. More controversially, secondary trading may provide the means by which **“rich” dominant carriers can consolidate their position at Level 3 airports or**

⁶⁹ As will be discussed in Section 3.3, LHR is the prototypical “super-congested” airport, as a result of the extreme scarcity of “open” slots there.

⁷⁰ A version of Figure 3.1, updated to 2019, has appeared very recently (Heathrow Airport Limited, 2019). For 2017, 2018 and 2019, it indicates that the situation remained exactly the same as in 2008 through 2016, with minimal availability of slots through the pool and almost exclusive reliance on slot transfers for any slot mobility.

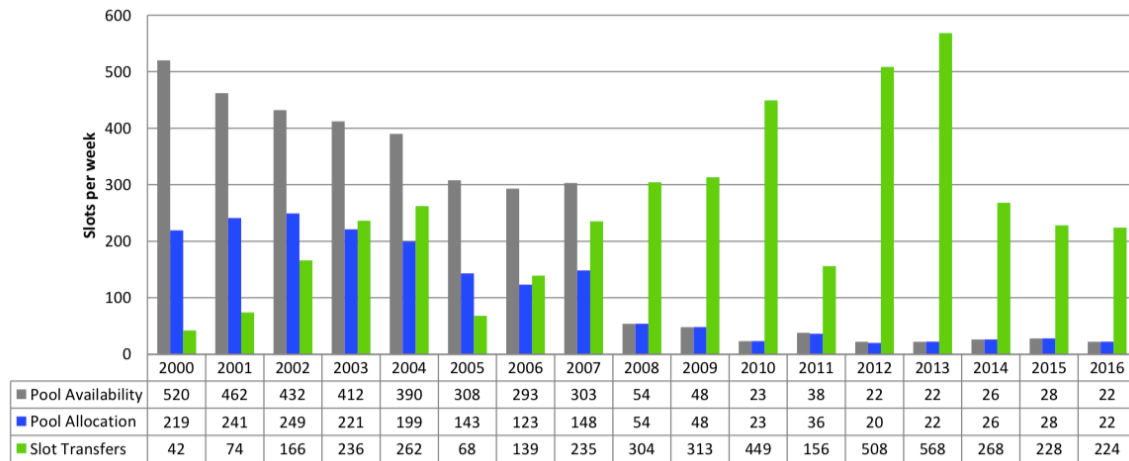


Figure 3.1: Pool availability, slots allocated through the pool and slot transfers at LHR, 2000-2016. [Note: One daily arrival/departure slot pair means 14 slots per week.] Source: ACL, 2016.

strengthen it further, thus improving the services they offer (e.g., more connections between intra-carrier flights), but also increasing slot concentration at the airport and their market power. At LHR and LGW airlines have pursued two parallel paths to this end: purchase more slots through secondary trading; and acquire (or merge with) airlines that hold a large number of slots at the airport of interest. At LHR, for instance, the share of slots held by British Airways (BA) has increased substantially from 40.7% in Summer 2005 to 42.5% in Summer 2011 to 51.6% in Summer 2017⁷¹. The main contributor to this increase was not secondary trading, but the acquisition of British Midland Airways (BMI) by BA’s parent company, the International Airlines Group (IAG), in 2012 and the subsequent integration of BMI into BA. The principal motivation for the acquisition is believed to have been the slots that BMI held at LHR. At LGW, the share of British Airways declined from 28.3% to 17.5% to 16.2%, in S05, S11 and S17, respectively, as a result of corporate decisions to reduce the airline’s

⁷¹ Data on shares of slots at LHR and LGW were provided by ACL.

presence there⁷² and to strengthen it at LHR instead. At the same time, EasyJet increased its share from 13.9% to 35.4% to 42.7% during the same years. This was accomplished primarily through (i) EasyJet's acquisition of GB Airways (a former BA subsidiary) in 2008 that increased by 7% its share of airport slots to 24% (and correspondingly decreased BA's share) and (ii) EasyJet's purchase, through secondary trading, of a large block of slots from Flybe in 2013⁷³.

§3.22. Two other issues related to secondary trading raise even more fundamental concerns. These are: (a) the widely held perception that **secondary trading may result in “windfall profits” for incumbent carriers;** and (b) **the disincentives that secondary trading may create when it comes to investments aimed at increasing airport capacity.**

Regarding (a), it is important to note that, under current secondary trading practice in the UK, **slots are treated, for most practical purposes, as airline property**, with (i) the seller of a slot being the sole recipient of the monetary compensation for the slot, (ii) the slot being transferred in perpetuity to the buyer (as long as the “80-20 use-it-orlose-it rule” is satisfied) and (iii) no conditions being attached to the sale other than compliance with Regulation 95/93 regarding slot transfers. The revenue derived by the original holders of such traded slots from these transactions constitutes a “windfall profit” in the eyes of many, as the sellers have very often obtained these slots for free⁷⁴ – before the airport was even designated as Level 3, in many cases. The issue of slot ownership is discussed further in §3.24 below.

⁷² Some of this reduction was offset by slot transfers from BA to Vueling, a fellow member of IAG's group of airlines. More recently, BA has obtained more slots at LGW through the purchase by IAG of the slots of Monarch Airlines in late 2017, following the latter's bankruptcy. The cost to IAG of the LGW slots was reported in the media as being of the order of £50 million.

⁷³ https://en.wikipedia.org/wiki/Gatwick_Airport#Major_airlines, accessed March 17, 2019.

⁷⁴ In the words of a widely cited editorial [*The Economist*, Nov. 16, 2017] “legacy carriers can pocket the proceeds of plum slots they did not pay for”.

§3.23. Turning to concern (b), capacity expansion proposals (especially those, like an additional runway, that would create a sizable block of new slots) may pose a dual threat to incumbent airlines at highly congested Level 3 airports where secondary trading is allowed. First, such **expansion may lead to increase competition** and lower airfares by enabling entry by more carriers (e.g., low-cost new entrants, non-European airlines) that could initiate new services (e.g., on profitable long-haul routes). Second, the **additional capacity would reduce the scarcity of slots and thus dilute the value of the slot portfolios of incumbents** in the secondary market. **These threats may well act as important disincentives for these carriers – particularly dominant ones – when it comes to supporting capacity expansion initiatives.** In fact, at highly congested airports, incumbents may be ambivalent even about initiatives aimed at modest increases in slot availability – for example, measures implementing steps that lead to more efficient use of the existing airport infrastructure.

The Issue of Slot Ownership

§3.24. The fundamental issue of “slot ownership” underlies much of the ongoing controversy regarding “windfall profits” that may accrue to airlines as a result of secondary trading. Despite the fact that Article 2 of Regulation 95/93 (as well as the WSG) define a slot as a “**permission given by a coordinator ... to use the full range of airport infrastructure**” [**bold added**], slots are treated in UK secondary trading as essentially airline property, as noted in §3.22. If the question of “who owns a slot?” is not resolved in a definitive way, the controversy will persist, along with a host of related questions regarding slot allocation and slot-related rights. The lack of and need for clarity on this point has been highlighted in a legislative resolution⁷⁵ of the European Parliament on Dec. 12, 2012 (paragraph 5a):

“The relevant theory and case-law have not yet advanced sufficiently to produce an exhaustive legal definition of the term “airport slots”. As of now it is expedient to

⁷⁵ “Parliament legislative resolution of 12 December 2012 on the proposal for a regulation of the European Parliament and of the Council on common rules for the allocation of slots at EU airports (recast)” (COM(2011)0827 – C7-0458/2011 – 2011/0391(COD)).

work on the assumption that the use of slots in the public interest – hence not in any sense a public good – may serve as a guideline for a legal definition of the term. It is therefore appropriate to formulate a definition of slots which establishes that they may become the subject of rights and governs their allocation.” [Am. 79]

Slot ownership is obviously **a very complex legal issue** (and one that lies well beyond the competence of this author). Because of its complexity and the major implications that any eventual resolution will have, **regulators – and the industry as a whole – have, sometimes deliberately, shied away from it** over a long period of time. For instance, the UK’s Civil Aviation Authority, in the context of considering the implementation of secondary trading at UK’s airports, carried out a consultation on the issue of slot ownership in 2001. In its final report, the CAA noted at the outset that *“ownership of slots under existing arrangements is disputed: governments, airlines and airports have all claimed ownership”*. But, it did not pass judgment on the matter eventually, concluding that *“the issue of ‘ownership’ is a separate policy decision relating to the distribution of scarcity rents that ought to be distinguished from the objective of maximising the value of production from slots”* (CAA, 2001). In effect, the CAA agreed with sanctioning the use of secondary trading (so as to “maximize the value of production from slots”), while stating that the distribution of the proceeds from such trading should be treated as a separate issue, whose outcome hinges on the (future) resolution of the ownership question.

In a similar vein, in its review of proposed revisions to Regulation 95/93, Steer Davies Gleave (2011) reported on responses from aviation stakeholders to the question *“Does the current lack of definition of ownership of slots cause any problems for the slot allocation system?”*. In summary the responses were as follows (Steer Davies Gleave 2011): *“almost all airlines and airline associations argued that it was not necessary to define the ownership of slots in any more detail than the current Regulation does”*; *“coordinators all believe that it is not necessary to define the ownership of slots and the current Regulation works well without this”*; *“most States considered that the lack of definition of the ownership of slots had not been a problem”*, (although with some nuances); *“a number of airports and airport associations argued that the airports should own the slots”*; and *“there was no consensus amongst other*

stakeholders [these were apparently mostly national regulators] *with some arguing that a definition would be helpful and others arguing that it was unnecessary*", with the Danish Competition and Consumer Authority stating that *"ownership should be defined as part of a general revision to the process for allocation of slots, including withdrawal of grandfather rights, in order to facilitate market entry"*. The conclusion of the Steer Davies Gleave (2011) report was that *"there is no benefit in introducing a definition of the ownership of slots"* (p. 279).

Despite the understandable reluctance to do so, it is believed here that **it is essential to address at this time the slot ownership issue, while recognizing that this may be a time-consuming and strenuously contested process.** Resolution of the issue, no matter in which direction, will have a critical impact not only on the question of how proceeds from the sale of slots should or can be distributed, but also on a host of other important questions. For example: Can a series of historic slots be withdrawn from a carrier for reasons other than not satisfying the "80-20 use rule"? Can airlines monetize the value of slots that were not acquired through secondary trading as intangible assets in their balance sheets⁷⁶? Can they issue bonds securitized against their slot portfolios⁷⁷, which amounts to "a *de facto* confirmation of their claim to property rights on slots"? Do slots and the

⁷⁶ For instance, British Airways Plc in its December 31, 2017 *Annual Report and Accounts* lists "landing rights" with a value of £646 million among its intangible assets, stating that "landing rights acquired from other airlines are capitalised at cost on acquisition (or fair value when acquired through a business combination)" and that "capitalised landing rights based within the EU are not amortised, as regulations provide that these landing rights are perpetual". BA's parent group, IAG, similarly listed landing rights with a value of €1,556 million as of December 31, 2018. <https://www.iairgroup.com/~media/Files/I/IAG/documents/annual-report-and-accounts-2018-interactive.pdf>

⁷⁷ In 2015, Virgin Atlantic International Ltd, a subsidiary of Virgin Atlantic, raised £220m in debt using its Heathrow landing slots to secure the loan, "*the first time in Europe a company has used airport take-off and landing slots in this way*". <https://www.cityam.com/virgin-atlantic-raises-220m-from-mortgaging-its-heathrow-landing-slots/>

attendant rights and privileges expire if an airport's designation changes from Level 3 to Level 1 (due to expansion of capacity or any other reason)?

A passage from a 20-year-old legal paper (Soames and Goeteyn, 1999) demonstrates how little progress has been made on this issue. It states: "*Intimately linked with the debate on the sale of slots is the question as to who actually owns the slots. This debate is yet unresolved.*"

Options

§3.25. Absent any wholesale changes to the existing regulatory framework for Level 3 airports, three options regarding secondary trading are available at an EU-wide (or 32-State-wide) level:

- (a) Prohibit any slot transfers that include monetary compensation at EU Level 3 airports.
- (b) Maintain the *status quo*, i.e., leave it up to each Member State to decide whether to authorize secondary trading and associated rules.
- (c) Permit secondary trading at all EU Level 3 airports, subject to certain safeguards.

Option (a) is not attractive because it is probably unenforceable in practice and would mark a retreat from introducing, even to a limited extent, an economic instrument into the slot allocation process. Option (c), on the other hand, deserves serious consideration as an alternative to the *status quo*, especially in light of the growing scarcity of free slots at some of the busiest airports that operate under Regulation 95/93 (see also Section 3.3 on Super-Congested Airports).

§3.26. Regulation along the lines of Option (c) could be based on a combination of the 2011 Proposal of the Commission and an amendment proposed by the Council in 2012⁷⁸. The Commission's 2011 Proposal takes a strong stand in favor of EU-wide secondary trading in its Explanatory Memorandum (paragraph 26), which states: "*In order to encourage greater slot mobility, the proposal expressly allows airlines to buy and sell slots*". Indeed, the text of Article 13 of the 2011 Proposal draws no distinction

⁷⁸ Doc 15442/12, Aviation 163, CODEC 2482, Interinstitutional File 2011/0391 (COD), October 2012.

between transfers/exchanges with monetary compensation and those without compensation:

"1. Slots may be:

(a) transferred by an air carrier from one route or type of service to another route or type of service operated by that same air carrier;

(b) transferred between two air carriers, with or without monetary or any other kind of compensation;

(i) between parent and subsidiary companies, and between subsidiaries of the same parent company;

(ii) as part of the acquisition of control over the capital of an air carrier;

(iii) in the case of a total or partial take-over when the slots are directly related to the air carrier taken over;

(c) exchanged, one for one, between air carriers, with or without monetary or any other kind of compensation."

Subsequently, the Council proposed amending the above-cited section of Article 13, by inserting [Article 13(1a)] the following condition:

*"A Member State may implement on its territory **temporary** restrictions to exchanges and transfers with monetary or any kind of compensation, ... where a significant and demonstrable problem in relation to these exchanges or transfers occurs. Such restrictions ... shall be ... duly notified to the Commission. On this basis, the Commission may oppose such restrictions within a period of three months..." [bold added].*

§3.26. The related question of how proceeds from secondary trading (or from such "market-based" mechanisms as congestion pricing or slot auctions) should be allocated has received much attention from economists over the years. A possibility that deserves consideration is presented in a legislative resolution of the European

Parliament (EP)⁷⁹. The resolution proposed the following amendment [Am. 64] to Article 13 of the 2011 Proposal of the Commission:

“Member States may adopt measures to allocate a portion of the revenue generated from the slots trading to a fund in order to cover the costs of developing airport infrastructure and optimizing related servicesThe revenues generated from the slot trading at one airport shall be reinvested at the same airport.”

This is a possibility that has also been widely suggested in the professional literature of transportation economics⁸⁰.

The aforementioned EU Council document⁸¹ also takes pains to attest to the legitimacy of this scheme:

“Recognising that slots can be traded, ... nothing in this Regulation could be considered as preventing a Member State to impose a tax in the event of a transfer or exchange of slots with monetary compensation between two airlines, while fully respecting Union law.”[p. 29]

§3.27. Consideration should also be given to amending Regulation 95/93 to address *explicitly* issues concerning *slot leasing* and the practice of *“slot babysitting”*. These practices and associated issues can be viewed as related to secondary trading.

Regulation 95/93 is notably silent with regard to slot leasing and temporary slot transfers. In fact, the terms “leasing” and “temporary transfers” do not appear anywhere in the Regulation, despite the fact that such transactions are taking place in practice and may possibly include monetary compensation, thus being classifiable as a form of secondary trading. Because the Regulation does not explicitly provide for temporary transfers, the parties involved in leasing agreements sign contracts that

⁷⁹ “European Parliament legislative resolution of 12 December 2012 on the proposal for a regulation of the European Parliament and of the Council on common rules for the allocation of slots at EU airports (recast)” (COM(2011)0827 – C7-0458/2011 – 2011/0391(COD)).

⁸⁰ See, e.g., a seminal paper by Levine (2009); in addition to a distinguished career in academia, he also served for several years as president of a major low-cost US airline.

⁸¹ Doc 15442/12, Aviation 163, CODEC 2482, Interinstitutional File 2011/0391 (COD), October 2012.

commit them to an initial transfer at a particular time and then to reversing the transfer at a future date.

So-called “babysitting” arrangements constitute one particular type of temporary slot transfer. A carrier that may be unable or unwilling, for whatever reason, to operate a set of slots enters into contract with another carrier which agrees to operate these slots for a season and then hand them back to the original slot holder at the end of the season. In this way, the original holder does not risk losing the slots under the “use-it-or-lose-it” provision of the Regulation. This is a form of slot hoarding that is difficult to distinguish from more *bona fide* slot leases, thus making it hard to collect reliable data on the extent and details of the practice. The practice can be harmful in other ways, as well, as it may result in inefficient use of valuable slots – for instance, operations with smaller aircraft in order to just satisfy the 80% use threshold at minimum cost and thus avoid loss of the slots.

§3.28. Finally, as already noted, there is **pressing need for addressing the slot ownership question**, which is central to much of the contentiousness surrounding secondary trading and to many other issues related to the allocation and management of slots, in general. This is an undertaking that will probably take a significant amount of time. The process of revising and amending the Regulation must therefore necessarily proceed (including the consideration of options regarding general adoption of secondary trading, see §3.25 - §3.27) while the question of slot ownership is being resolved. This is unfortunate, but no different from what has been the case all along. Once the question of ownership is resolved, the parts of the regulation that will be impacted by the outcome can be reconsidered and amended as necessary. The end result will be to **remove a long-standing “gray area”** in the Regulation regarding a truly critical set of questions.

Summary and Conclusion

§3.29. Secondary trading, as practiced today at some Level 3 airports in the UK, has important positive and negative impacts. The realistic options for the future are at this point (i) continuation of the existing hands-off policy that leaves it up to Member States to decide whether to permit secondary trading at Level 3 airports in their

territory (to date only the UK does), or (ii) amending Regulation 95/93 to permit secondary trading throughout the EU, subject to certain conditions.

The choice between these two options is a “close call”, but it seems advisable under current circumstances (increasing scarcity of slots, an allocation process which is currently of an entirely administrative nature) to give full consideration to Option (ii), which introduces a much-needed economic instrument as a possible part of the process. The 2011 Proposal of the Commission, in combination with related proposed amendments to it that were introduced by the Council and the EP, could provide the basis for a regulatory framework whose spirit is consistent with Option (ii). The EP and Council amendments would give Member States the right to impose temporary restrictions on secondary trading in their territory in cases where “*a significant and demonstrable*” problem may arise in connection with such trading.

Serious consideration should also be given to (a) the possibility (also raised in an EP amendment to the 2011 Proposal) of allocating a portion of the revenue generated from the secondary trading of slots to a fund dedicated to increasing airport capacity through improvements in infrastructure and procedures and (b) extending the scope of this part of the Regulation to address issues associated with slot leasing and temporary transfers.

Most important, it is essential to finally resolve in a definitive way the issue of slot ownership at Level 3 airports.

3.3 Super-Congested Airports

Background

§3.29. Level 3 airports in the EU and in Europe are very diverse as a group. For the purposes of this section, they can be subdivided into at least three subgroups. One is the set of what could be called “*generic*” Level 3 airports. They generally have limited availability of slots during the peak hours of the day, but have sufficient remaining capacity during off-peak times to accommodate most or all requests for new slots, as long as the requesting airlines are willing to operate the requested flights at times that may differ – sometimes significantly – from the times that were originally requested. Regulation 95/93, both in its original form and as amended, is clearly designed to regulate the slot allocation process at airports that fit this particular mold. Of the roughly 100 Level 3 airports where Regulation 95/93 is applied (see Table 1.3), airports that belong in this subgroup mostly serve a large number of annual passengers (the typical range at this time is 10-30 million⁸²) and process a relatively steady number of movements throughout the year.

A second subgroup consists of highly seasonal, smaller airports, many of them in Southern Europe – notably in Greece, Italy and Spain – with fewer than 10 million annual passengers⁸³, including a considerable number with fewer than 1 million (Table 1.3). The issues posed by many of the airports in this “*seasonal*” group are quite different from those associated with the generic group and mostly center on allocating slots among a diverse set of airlines – including many specializing in holiday travel – during the (often few) peak weeks of the Summer or Winter seasons when these airports are in high demand.

Finally, a third subgroup consists of airports that are currently operating at **saturation or near-saturation levels**, meaning that nearly all slots are already

⁸² But some airports in this subgroup may fall outside this range. For instance, Madrid (57.9 million passengers in 2018) and Milan Linate (9.2 million) would both be included in this generic group.

⁸³ There are several airports with more than 10 million annual passengers, such as Palma de Mallorca (29.1 million passengers in 2018) and Venice (11.2 million) that could be considered members of this seasonal group.

occupied during most hours of the busy days of the week (e.g., Monday through Friday) throughout several of the busiest months of a season. Demand at these airports (i.e., the number of requested slots for a season) may exceed the declared capacity of the airport for several or, even, most hours of the day on many days of a season. As a result, the overwhelming majority of slots at these airports eventually become “historic” (and grandfathered), thus leaving little or no room for accommodating requests by carriers wishing to initiate additional services. Coordinators are then forced to reject routinely some – often many – new slot requests, year after year. Moreover, there is much latent (“hidden”) demand for access to these airports: airlines that may have wished to add more flights, often refrain from submitting slot requests, being aware of the unavailability of open slots suited to their needs. Should the capacity of these airports increase significantly (e.g., as a result of infrastructure expansion), it can be expected that numerous additional requests will be submitted for the newly created slots, reflecting the latent demand. This group of “*super-congested*” airports is of critical importance to EU’s air transport system. This section will review issues associated with them.

§3.30. The conditions that prevail today at super-congested airports were most probably not anticipated at the time Regulation 95/93 and its amendments of the early 2000s were promulgated. Article 3 of Regulation 95/93 refers to Level 3 airports as experiencing a “*shortfall in capacity*”, “*insufficient for actual or planned operations at certain periods*” – not a virtually total unavailability of capacity for long parts of five or more days per week during peak periods of the year. **Super-congested airports thus pose a different set of issues than generic Level 3 airports and may require a different approach to slot allocation than the one currently described in Regulation 95/93.** The main task of coordinators at a generic Level 3 airport is to determine a set of slot assignments that accommodate most (usually all) new requests (plus any requests for the re-timing of “historic” slots) in ways that comply as closely as possible with airline preferences and minimize slot displacement. Instead, at super-congested airports, **the principal challenge is often to decide which new requests, if any, to accept and which to reject in order to best promote such objectives as improving airport**

connectivity and/or maintaining a reasonably competitive environment that prevents dominant incumbent carriers from extracting scarcity rents at the airport. Clearly, this is a very different task than Level 3 airport coordinators were originally intended to perform. **The administrative rules first specified in the WSG, and largely replicated subsequently in Regulation 95/93, are inadequate for guiding the allocation of slots at super-congested airports and will become even more so over time. Serious consideration should therefore be given to expanding the scope of Regulation 95/93 in ways that address specifically issues relevant to these increasingly critical airports.**

§3.31. Treating super-congested airports as a separate class, possibly to be designated as “**Level 4**”, has been suggested repeatedly in recent years, as a growing number of airports approach saturation levels. Tables 3.6 through 3.10 contrast the situation at London Heathrow (LHR), London Gatwick (LGW), and Dublin (DUB) with that in Madrid (MAD).

LHR is often mentioned as the archetypical example of a super-congested airport. Table 3.6 shows the number of scheduled movements⁸⁴ (arrivals on the left half and departures on the right) per hour at LHR for a busy week of S18, as well as the declared capacity (in **bold**) of LHR’s runway system in each hour of the day for S18. The demand schedule shown is as of HBD (“Historics Baseline Date”⁸⁵) of the S18 season (January 31, 2018)⁸⁶. LHR imposes severe restrictions on the number of flights between 23:30 and 06:00 local time.

Table 3.7 next shows the number of open slots remaining at LHR for the week in question in each hour of each day (i.e., the difference between the declared capacity and the demand in each hour shown in Table 3.6). The airport has practically *no empty slots on all weekdays of that week*: for instance on Monday, 1378 of the 1385 arrival and departure slots – or 99.5% of the available runway slots – are

⁸⁴ The reason for highlighting in red certain numbers in Tables 3.6, 3.8 and 3.9 will be explained later.

⁸⁵ See Chapter 2, Section 2.2.

⁸⁶ As noted in Chapter 2, the actual schedule on the week in question may eventually differ from the one anticipated as of HBD.

	Arrivals								Departures							
	M	T	W	T	F	S	S	Cap	M	T	W	T	F	S	S	Cap
0500	39	39	39	39	39	39	39	39	25	25	25	25	25	24	20	25
0600	39	39	39	39	39	39	39	39	45	45	45	45	45	43	37	45
0700	37	37	37	37	37	37	37	37	42	42	40	42	42	40	42	42
0800	45	45	45	45	45	45	45	45	45	45	45	45	45	45	44	45
0900	42	42	42	42	42	42	42	42	43	43	43	43	43	42	42	43
1000	41	41	41	41	41	41	39	41	44	44	44	43	44	44	44	44
1100	40	40	40	40	40	39	40	40	40	40	40	40	40	39	40	40
1200	43	43	42	43	43	40	42	43	44	44	44	44	44	43	44	44
1300	39	39	39	39	37	38	37	39	45	45	45	45	45	42	45	45
1400	41	41	41	41	41	39	41	41	44	44	44	44	44	44	43	44
1500	43	43	42	43	43	38	43	43	45	45	45	45	45	43	45	45
1600	42	42	42	41	42	35	42	42	43	42	43	43	43	42	43	43
1700	45	45	45	45	45	36	42	45	44	44	43	43	43	38	44	44
1800	42	43	42	43	43	40	43	43	44	42	44	44	44	35	44	44
1900	40	41	41	41	39	33	41	41	44	45	45	45	45	37	45	45
2000	42	42	42	42	42	35	41	42	29	32	31	32	30	29	30	32
2100	22	22	22	22	22	18	22	22	30	31	30	31	28	29	29	31

Table 3.6: Demand and declared capacity of the runway system for arrivals and departures for a busy week (Week 4) of S18 at LHR; the demand schedule is as of HBD (Jan. 31. 2018) of the S18 season; times shown are UTC (Source of data: ACL)

	Arrivals							Departures						
	M	Tu	W	Th	F	Sat	S	M	Tu	W	Th	F	Sat	S
0500	0	0	0	0	0	0	0	0	0	0	0	0	1	5
0600	0	0	0	0	0	0	0	0	0	0	0	0	2	8
0700	0	0	0	0	0	0	0	0	0	2	0	0	2	0
0800	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0900	0	0	0	0	0	0	0	0	0	0	0	0	1	1
1000	0	0	0	0	0	0	2	0	0	0	1	0	0	0
1100	0	0	0	0	0	1	0	0	0	0	0	0	1	0
1200	0	0	1	0	0	3	1	0	0	0	0	0	1	0
1300	0	0	0	0	2	1	2	0	0	0	0	0	3	0
1400	0	0	0	0	0	2	0	0	0	0	0	0	0	1
1500	0	0	1	0	0	5	0	0	0	0	0	0	2	0
1600	0	0	0	1	0	7	0	0	1	0	0	0	1	0
1700	0	0	0	0	0	9	3	0	0	1	1	1	6	0
1800	1	0	1	0	0	3	0	0	2	0	0	0	9	0
1900	1	0	0	0	2	8	0	1	0	0	0	0	8	0
2000	0	0	0	0	0	7	1	3	0	1	0	2	3	2
2100	0	0	0	0	0	4	0	1	0	1	0	3	2	2
Total	2	0	3	1	4	50	9	5	3	3	2	6	42	20

Table 3.7: Number of open slots per hour at LHR for Week 4 of S18 season as implied by Table 3.6. (Source of data: ACL)

	Scheduled Movements							Capacity	Open Slots						
	M	T	W	T	F	S	S		M	T	W	T	F	S	S
0400	19	18	17	18	17	15	19	29	10	11	12	11	12	14	10
0500	48	48	48	47	48	48	48	48	0	0	0	1	0	0	0
0600	54	54	54	54	54	54	48	54	0	0	0	0	0	0	6
0700	52	52	52	51	52	52	52	52	0	0	0	1	0	0	0
0800	51	51	51	51	50	51	49	51	0	0	0	0	1	0	2
0900	49	48	47	49	49	48	48	49	0	1	2	0	0	1	1
1000	55	54	55	55	55	55	55	55	0	1	0	0	0	0	0
1100	55	55	55	55	55	54	55	55	0	0	0	0	0	1	0
1200	55	55	55	55	55	55	55	55	0	0	0	0	0	0	0
1300	53	52	53	53	53	53	52	53	0	1	0	0	0	0	1
1400	51	50	51	51	51	51	51	51	0	1	0	0	0	0	0
1500	52	52	50	52	52	51	51	52	0	0	2	0	0	1	1
1600	53	55	55	54	55	50	55	55	2	0	0	1	0	5	0
1700	55	54	55	55	55	43	55	55	0	1	0	0	0	12	0
1800	54	54	54	54	54	47	52	54	0	0	0	0	0	7	2
1900	46	44	46	46	46	36	46	46	0	2	0	0	0	10	0
2000	42	41	42	39	43	33	43	43	1	2	1	4	0	10	0
2100	41	38	40	38	41	36	40	41	0	3	1	3	0	5	1
2200	24	22	23	28	29	29	29	29	5	7	6	1	0	0	0

Table 3.8: The demand (as of HBD) and runway capacity at LGW for Week 20 of S17 are shown in the left half of the table; the right half shows the remaining open slots in each hour of the week; times shown are UTC. (Source of data: ACL)

	Summer 2016							Summer 2018						
	M	T	W	T	F	S	S	M	T	W	T	F	S	S
0000	30	31	32	30	31	30	31	26	26	23	23	23	24	19
0100	32	31	31	31	30	31	31	32	30	30	30	29	30	31
0200	31	30	31	31	31	32	32	31	30	31	31	31	31	32
0300	28	28	29	29	29	29	30	25	26	26	23	24	26	27
0400	8	6	8	7	8	10	14	2	0	0	0	1	5	10
0500	2	2	1	2	1	0	2	1	0	0	0	2	0	2
0600	1	2	1	0	5	1	6	0	0	1	0	0	0	4
0700	0	2	4	2	5	3	11	0	0	0	1	3	0	3
0800	0	1	1	1	0	4	1	0	0	0	0	0	1	6
0900	0	0	1	0	1	2	0	1	0	0	0	1	2	2
1000	1	1	3	2	1	1	1	2	0	2	0	1	0	1
1100	1	5	5	2	1	0	0	0	3	3	2	1	2	1
1200	0	3	0	2	1	7	0	0	2	0	1	0	2	0
1300	0	8	6	9	8	6	5	1	4	4	1	1	1	0
1400	13	16	10	11	12	14	13	0	5	0	1	0	2	0
1500	0	0	0	0	1	5	2	1	2	0	0	0	3	1
1600	1	1	0	0	0	9	0	1	3	3	0	0	9	0
1700	0	0	1	0	0	9	4	0	1	0	0	0	5	0
1800	0	0	5	0	0	11	1	0	0	1	0	0	10	2
1900	1	6	5	1	0	17	4	0	2	1	3	0	9	0
2000	15	19	18	15	16	24	15	8	10	10	10	5	20	11
2100	16	15	15	16	16	21	19	10	11	10	11	7	17	9
2200	9	7	6	8	6	8	6	7	4	5	5	6	6	8
2300	25	22	27	22	25	14	22	21	20	23	21	24	16	21

Table 3.9: Comparison of the number of open slots at DUB for two busy weeks (Week 13 in both cases) in S16, on the left, and in S18, on the right. Note that during the busiest 16 hours of the day (04:00 – 19:59) and especially on weekdays (Monday-Friday) the number of open slots had diminished greatly by S18. The demand schedule is as of HBD for both the S16 and S18 seasons. Times shown are UTC. (Source of data: ACL)

	SCHEDULED MOVEMENTS			AIRPORT CAPACITY			DIFFERENCE BETWEEN CAPACITY AND SCHEDULED MOVTS		
	ARR	DEP	TOT	ARR	DEP	TOT	ARR	DEP	TOT
00:00	1	2	3	20	20	38	19	18	35
01:00	1	1	2	20	20	38	19	19	36
02:00	1	2	3	20	20	38	19	18	35
03:00	11	3	14	20	20	38	9	17	24
04:00	15	21	36	17	29	46	2	8	10
05:00	18	48	66	48	52	100	30	4	34
06:00	25	40	65	48	52	100	23	12	35
07:00	46	30	76	48	52	100	2	22	24
08:00	48	34	82	48	52	100	0	18	18
09:00	31	50	81	48	52	100	17	2	19
10:00	31	45	76	48	52	100	17	7	24
11:00	46	17	63	48	52	100	2	35	37
12:00	48	38	86	48	52	100	0	14	14
13:00	35	52	87	48	52	100	13	0	13
14:00	23	52	75	48	52	100	25	0	25
15:00	30	27	57	48	52	100	18	25	43
16:00	35	25	60	48	52	100	13	27	40
17:00	31	42	73	48	52	100	17	10	27
18:00	41	33	74	48	52	100	7	19	26
19:00	40	30	70	48	52	100	8	22	30
20:00	43	18	61	48	52	100	5	34	39
21:00	22	19	41	28	20	48	6	1	7
22:00	11	3	14	20	20	38	9	17	24
23:00	3	3	6	20	20	38	17	17	32

Table 3.10: Demand and declared capacity for arrivals and departures and number of open slots for one of the expected busiest days of S19 (June 22, 2019) at MAD. Even during the 16 busiest hours of the day, there is a significant number of open slots in all but a few peak hours. Times shown are UTC. (Source of data: AECFA)

occupied! Whatever limited slot availability remains is at less desirable flight times, such as late Saturday evening or early Sunday morning.

Table 3.8 shows that the situation at LGW is very similar to LHR's. Very few flights operate during the night and the table shows only the total number of scheduled movements and the number of open slots during the busy part of the day. When it comes to availability of open slots, LGW is just as congested as LHR during practically all these busy hours (i.e., from 05:00 to 21:59 UTC). For instance, on the Monday of the week shown, 866 of the 869 existing runway slots between 05:00 and 21:59 (or 99.7%) are occupied.

Table 3.9 presents, for comparison with the right half of Table 3.8, an analogous list of the number of available slots at Dublin Airport (DUB) for a busy week of the S16 season, on the left, and of the S18 season, on the right. DUB operates 24 hours a day and has many slots still available between 20:00 and 03:59 UTC. However, due to a rapid increase in traffic in recent years, the number of available slots between 04:00 and 19:59 UTC declined greatly between S16 and S18. While, even in S18, DUB is less congested than LGW (and LHR), it, too, is clearly near or at super-congested status.

Table 3.10, by contrast, shows the expected demand, declared runway system capacity and open slots (as of HBD 2019) for arrivals, departures and total movements at MAD on June 22, 2019 – one of the (projected) busiest days of the S19 season. Although the demand in certain periods of the day (e.g., for arrivals between 07:00 and 08:59 and between 11:00 and 12:59 UTC) is virtually equal to the declared capacity, there is significant overall slot availability in the day, as a whole (especially when it comes to total movements). For this reason, MAD would be classified as a generic Level 3 airport, in our terminology, as opposed to a super-congested one.

Designation as a Super-Congested ("Level 4") Airport

§3.32. Should Regulation 95/93 be amended to address the issues faced at super-congested airports, a new class of "Level 4" airports will be added to the existing classes of Level 1, 2 and 3. In such an event, **special care should be taken to define clearly the conditions under which an airport would be designated as Level 4.**

This can be done by: (i) specifying, in quantitative terms, *thresholds* that, if exceeded, would qualify an airport for such designation; and, (ii) if necessary, describing, in more qualitative terms, any *other conditions* that the airport must fulfill.

Developing this set of specifications for inclusion in the Regulation will require a process of consultation with stakeholders and follow-up deliberations. The process should be informed by the realization that **the allocation and management of slots at Level 4 airports will require strong tactical and strategic measures that may go well beyond those currently applied at “generic” Level 3 airports. Thus, the conditions and thresholds that will be agreed should be demanding, so that only a small number of airports would qualify as Level 4 and be eligible for such exceptional treatment.**

Qualifying airports should, at a minimum, possess two sets of characteristics. They should:

- (a) Be approaching a state of “gridlock” when it comes to availability of slots during most of the common operating hours for several days during busy weeks.
- (b) Serve a large number of passengers per year and play an important regional role, such as acting as a hub for a large airline or for long-haul flights to a particular part of the world (e.g., South or North America).

Additional characteristics may be considered, such as requiring that the airport not be a seasonal airport serving primarily holiday travelers.

§3.33. For **illustration purposes only**, we provide here an example of the type of definition that may be called for. The subsequent discussion will also demonstrate some interesting points. The example definition is as follows:

“A Level 4 airport is one that: (a) during the most recent full calendar year served more than 25 million passengers, with the number of passengers served during any period of 4 consecutive months not exceeding 50% of the annual number; and (b) on the HBD of the most recent equivalent season (S or W), the expected total number of occupied slots during the “busy operating period” of the peak 5 days of a high-demand week exceeded 90% of the total declared capacity of the airport’s runway system – where “busy operating period” shall mean the period of 16 consecutive hours of the day

with the highest total number of scheduled movements.” [See below for further explanation.]

Condition (a) is intended to ensure that the airport is, first, one of the 20 or so busiest in Europe (the 25 million threshold could be increased periodically in response to overall growth in the number of passengers at European airports) and, second, is not a highly seasonal airport (the number of passengers during the peak 4 months of the year does not exceed 50% of the annual number). Condition (b) attempts to capture the “super-congested” aspect of the airport. Practically all airports experience an extended period of low demand every day, usually late in the night, during which airport operations slow down (e.g., from 22:00 or 23:00 to 05:00 or 06:00 of the next day, local time). This “slack” period corresponds to times that passengers (and, by extension, airlines) avoid when planning the beginning or end of their trips⁸⁷. The “busy operating period” in the above definition is the continuous extended time period that falls *outside* such slack periods and is defined here as consisting of the 16 consecutive hours of a day during which the great majority of the day’s aircraft movements take place⁸⁸. The starting time and ending time of this “busy operating period depends on geographical location, as well as on local living

⁸⁷ Geographic location is also an important factor. Some major hubs, especially in the Middle East, that emphasize transfers/connections have their busy periods during late night and early morning hours.

⁸⁸ The FAA has recently proposed similar types of thresholds, defined over multi-hour parts of the day, for identifying congested airports in the United States. Per the FAA, an airport is said to experience “significant congestion” if delay per runway movement exceeds 7 minutes for more than 30% of the hours between 07:00 and 22:59 local time; it is said to experience “severe congestion” if delay per runway movement exceeds 15 minutes for more than 50% of the hours in that time window. Note that, in the case of Level 3 airports in Europe, thresholds cannot be specified with reference to observed air traffic delays, because these delays are already controlled through the existing slot limits (= declared capacity). Thus, thresholds at European airports must necessarily be specified in terms of the availability of slots (as in our definition) and not in terms of observed delay. Note that “declared capacities” (= coordination parameters) and slot limits, in the sense described in the WSG and Regulation 95/93, are not applied at US airports, with the only exceptions (in some respects) being New York’s JFK and LaGuardia airports; the latter is a virtually all-domestic airport.

habits. For example, for busy airports in the Central European time zone, this is often the 16-hour period of 06:00-21:59 local time. Note, as well, that the five busiest days of the week are not specified: although they would normally be the five weekdays (Monday – Friday), the definition allows for the possibility that the airport experiences high demand on Saturdays and/or Sundays. The use of the HBD as the reference date for determining the rate of utilization of available slots is justified by the fact that this is the date when airlines “commit” to their slots. Slot use on the actual day of operations may differ from the one expected on HBD, but any changes will be mostly due to tactical decisions by the airlines (flight cancellations, addition of *ad hoc* flights, etc.) or to unforeseen events.

We have used the declared runway system capacity as a proxy for the overall capacity of the airport as, in practice, it is the runway system that most often acts as the most capacity-restricting element (the “main bottleneck”) of an airport. However, should one or more other elements of the airport’s infrastructure (e.g., some passenger terminals) also act as “bottlenecks”, the definition can be modified accordingly. Finally, the 90% threshold has been chosen arbitrarily. It is obvious that an airport where at least 90% of the total slots are occupied over a period of 16 hours each day, 5 days a week, is extremely congested. Obviously, an alternative threshold (or set of several thresholds, each referring to a different element of the airport) may be selected following study and consultation.

§3.34. The application of the above definition of a Level 4 airport can be illustrated for the examples of LHR, LGW, and DUB given in Tables 3.6 through 3.9.

Both LHR and LGW would qualify for Level 4 designation under our definition. They are not seasonal airports and serve many more than 25 million annual passengers. In the case of LHR (Tables 3.6 and 3.7), “the 16 peak consecutive hours of the busiest 5 days of a high-demand week” is the period between 05:00 through 20:59, Monday through Friday. The hourly scheduled demand for arrivals and departures during this period in the week shown is highlighted in red in Table 3.6. The total demand (sum of numbers in red) is 6634 movements, equal to 99.6% of LHR’s total declared capacity of 6660 movements during this period. Similarly, the period of interest at LGW (Table 3.8) runs from 05:00 to 20:59, Monday-Friday

during the high-demand week shown. The total demand (sum of numbers in red) is 4115 movements, equal to 99.4% of LGW's total declared capacity of 4140 movements during this period.

DUB (Table 3.9) is also a non-seasonal airport and exceeded 25 million passengers in both S16 (27.9 million) and S18 (31.5 million). Its 16-hour peak period runs from 04:00 to 19:59, Monday through Friday, for each of the two weeks shown. In Week 13 of S16, the slot occupancy rate was 93.6% (3165 occupied slots out of a total of 3380 available between 04:00 and 19:59 during the five weekdays, Monday – Friday), while by S18 that rate had reached 98.1% (3350 out of 3415 slots⁸⁹). Thus, all three of these airports would qualify as Level 4 under our definition.

§3.35. The definition of a Level 4 airport in §3.33 was then applied, **for illustration purposes only**, to a number of major European airports, chosen to include several airports known for slot scarcity. The results are summarized in Table 3.11.

Highlighted in red are instances in which the utilization rate, as defined in §3.33, exceeds 90% and highlighted in *red italics* instances in which it is between 85% and 90%. According to our definition, Dusseldorf⁹⁰ (DUS), Dublin (DUB), Frankfurt⁹¹ (FRA), London Gatwick (LGW), London Heathrow (LHR), Lisbon (LIS) and Munich (MUC) would qualify for Level 4 designation, while Palma de Mallorca (PMI), with a rate of 94.6%, would not because it is a highly seasonal airport serving more than 50% of its passengers during its four peak months (June – September).

⁸⁹ The number of runway slots at DUB between 04:00 and 19:59 increased by only 1% (from 3380 to 3415) between S16 and S18, but the number of allocated slots during that part of the day by 5.8% (from 3165 to 3350). This has been a common pattern through much of Europe – see also Section 3.6 regarding the slow growth of declared capacities.

⁹⁰ Local and state authorities set the hourly slot limit for DUS (currently a maximum of 45 total commercial movements per hour on the runway) based on environmental considerations.

⁹¹ FRA was experiencing extremely high utilization rates well before 2011, the year when its fourth runway was opened, and certainly qualified as a Level 4 airport at the time. Following the fourth runway's opening, the airport has been operating near the 90% utilization level (per our definition), as its declared capacity has been (by design) increased gradually (instead of all-at-once) over a number of years, while demand has also been increasing.

Airport	2018 pax (x10 ⁶)	2018 comm'l movts. (x10 ³)	Utilization	Comments
AMS*	71.1	499.4	87.4% 89.2% 88.5%	S16, 17/7-23/7 S17, 23/7-29/7 S18, 23/9-29/9
BCN	50.1	323.5	79.9%	S18, 'a peak day' (24/6)
CDG	72.2	480.9	76.9%	S18, 'typical busy day'
DUB	31.5	222.8	93.6% 98.1%	S16, 19/6-25/6 S18, 17/6-23/6
DUS	24.3	206.5	97.8%	S16, 19/9-25/9
FRA**	69.5	500.8	89.9% 90.1%	S16, 19/9-25/9 S18, 9/9-15/9
GVA	17.6	145.6	74.6%	S18, 10/9-16/9
HAM	17.2	141.0	68.3%	S16, 19/9-25/9
LGW	46.1	282.5	99.4%	S17, 5/8-11/8
LHR*	80.1	475.6	99.6%	S18, 15/4-21/4
LIS	29.0	213.7	98.8%	S19, 29/7-04/8
MAD	57.9	394.4	72.0%	S18, 'a peak day' (22/6)
MUC	46.3	392.2	90.0% 92.2%	S16, 19/9-25/9 S19, 22/9-28/9
ORY*	33.1	229.0	66.5%	S18, "typical busy day"
PMI	29.1	206.8	94.6%	S18, 'a peak day' (21/7)
STR	11.8	111.8	59.3%	S16, 19/9-25/9
SXF	12.7	91.5	65.3%	S16, 19/9-25/9
TXL	22.0	180.9	77.6%	S16, 19/9-25/9
VIE	27.0	239.3	68.3%	S18, busy summer week
ZRH	31.1	260.5	81.4%	S18, 10/9-16/9

Table 3.11: Utilization rates, as defined in §3.33, of some major Level 3 airports in the EU and in Switzerland.

* AMS, LHR and ORY operate under limits on annual number of slots of 500,000, 480,000 and 250,000, respectively.

** The declared capacity of the runway system of FRA (in terms of total movements per hour) was increased from 100 in S16 to 104 in S18.

Notes:

1. The season for which the rate was computed and the corresponding week is shown in the comments area.
2. For BCN, MAD, and PMI, the rate is computed on the basis of demand on only a single peak day, as indicated, and is only indicative of the true value.
3. For CDG and ORY, the rate is computed on the basis of demand on an unspecified "typical busy day" and is only indicative of the true value.
4. The demand used to compute the rate for AMS was the actual demand on the week indicated, not the demand as scheduled on HBD of the corresponding season; however, in the specific case of AMS, the demand as scheduled on HDB

and the actual demand, are roughly the same (see §2.10) and the utilization rates indicated in the table are therefore approximately correct.

5. CDG: The runway system's hourly declared capacity was based on S19 data – see: <http://www.cohor.org/en/aeroport-paris-charles-de-gaulle-cdg/>
6. PMI is a seasonal airport by our definition (handled 16 million passengers in the peak 4 months of 2018, exceeding 50% of the annual number of passengers).

Amsterdam Schiphol (AMS) operates close to the Level 4 threshold. It has a utilization rate of just below 90%, when computed against the declared capacity of its runway system. At the same time, the airport has already reached its (environmentally motivated) annual limit of 500,000 movements and thus cannot offer any additional slots, i.e., accept any more movements. Thus, barring an increase in the annual limit on movements, AMS can be considered a Level 4 airport for all practical purposes. Paris Orly (ORY) is a special case, as its current annual number of movements is close to its annual limit of 250,000 slots (again imposed for environmental reasons), while the coordination parameters of the airport are sufficient to accommodate a number of movements well in excess of this annual limit. The case of Munich (MUC) is also of special interest, as the recent rejection by local voters of the proposed third runway may lead to very high utilization rates and severe scarcity of slots, should demand continue to increase in coming years.

By contrast, the remaining airports in Table 3.11⁹² have utilization rates well below 90% and can be viewed as “generic” Level 3 airports. Slot availability is limited during the peak hours of the day, but sufficient capacity exists at other times to accommodate practically all requests for new slots – although possibly at times other than those requested. Note that the utilization rates for three of these airports [Barcelona (BCN), Paris CDG, Madrid (MAD)] were computed with data from only a single busy day of the season. But the utilization rates for these busy days are far below the 90% threshold, indicating that these airports could not possibly qualify at this time for Level 4 designation under the definition of §3.33.

§3.36. It is noted again that Table 3.11 and the discussion in §3.35 are intended only as an example of the type of considerations that a definition of a Level 4 airport should include and of how such a definition might be applied. The hypothetical definition presented in §3.33 is insufficient (measuring solely the utilization of the slots available per hour for arrivals and departures at only the runway system) to

⁹² Of the airports in Table 3.11, three are expected to add a new runway within the next 10 years: Dublin by the early 2020s, Vienna by the middle 2020s and London Heathrow by the late 2020s. Frankfurt is also constructing a major new Terminal 3, which may result in a further increase in slot availability.

capture the full scope of possible slot scarcities and was applied to only a small, pre-selected set of airports.

On the other hand, based on common knowledge about current conditions at Level 3 airports in the 32 States, **it seems reasonable to conjecture that the airports identified in §3.35 as potentially Level 4 would probably also qualify as such under any plausible (and broader) definition.** In other words, it would appear that **AMS (as long as the 500,000 annual movements limit is not raised), DUS (also limited by environmental constraints), DUB, LHR, LGW, and LIS, as well as, possibly, FRA and MUC⁹³ can be viewed as prime (but not exclusive) candidates for inclusion into a class of “super-congested” airports in the 32 States.** Despite their small number, the airports on this list play a critical role in the EU’s air transport system and its connectivity to the rest of the world. The list includes three of the four⁹⁴ most important hubs in the 32 States: AMS (Air France/KLM, Sky Team Alliance), LHR (British Airways, One World Alliance), and FRA (Lufthansa Group, Star Alliance). Moreover, DUB, MUC and LIS are all becoming increasingly important hubs for the IAG Group/One World, Lufthansa/Star Alliance, and connections to/from South America, respectively.

A few other airports, for which we did not have sufficient data, might also qualify, especially if the definition of “Level 4” is extended, as it should, to include other elements of the airport (terminals, aprons) or time scales other than hourly. Obviously, more airports may also join this group in the future [as also forecast by EUROCONTROL (2018)], should current robust rates of traffic growth persist.

It is noted again that, because of the potentially exceptional regulatory provisions that would apply to them, only a small number of airports should be able to qualify for Level 4 designation. However, it is conceivable that, once the regulatory provisions (see below) for Level 4 airports have been set, some Level 3 airports may

⁹³ As already noted, ORY is a special case deserving separate consideration.

⁹⁴ The fourth major hub is CDG.

be allowed, under special circumstances, to invoke some of these provisions⁹⁵ and take advantage of some of the opportunities afforded to Level 4 airports by the revised Regulation.

Regulatory Provisions

§3.37. Up to this point, this section has **underscored the importance of giving serious consideration to establishing a new class (“Level 4”) of airports, whose few, but very important members will be coordinated under a set of slot allocation rules and priorities that will take into account the special circumstances associated with each one of these airports individually. Super-congested airports have become a pressing issue for air transport in Europe. The current version of Regulation 95/93 is inadequate for addressing it. Adding special provisions to the Regulation to fill this gap is a matter of urgency.**

However, the development of regulation for the allocation and management of capacity at Level 4 airports requires careful study and analysis. Some general suggestions in this respect are outlined below.

§3.38. The broad objectives that should be set for any such regulatory changes are fairly obvious. Given that the overwhelming majority of slots at these airports are by now “historic” and grandfathered, with minimal numbers of open slots available through most of the useful hours of the day, regulatory measures intended for Level 4 airports should aim to accomplish two parallel goals:

- (i) Prevent slot stagnation (“gridlock”) – with the same airlines holding on to the same historic slots – and encourage some slot mobility.
- (ii) Maximize the airport’s economic and social welfare contributions at the local, national and Community levels.

To these purposes, relevant amendments to Regulation 95/93 should point in two directions:

⁹⁵ An example might be a large seasonal airport that faces gridlock conditions on a particular day of the week.

(a) Introduce **stronger tactical steps** that have potential for increasing slot mobility, enlarging the slot pool, and discouraging practices that may contribute to any waste of capacity.

(b) Allow Member States to invoke **airport-specific** strategic criteria for slot allocation that coordinators would treat as the primary allocation criteria at each individual airport.

The emphasis on airport-specific criteria in (b) recognizes that, while interventions into the slot allocation process at different Level 4 airports share common objectives (as stated in (i) and (ii) above), the approaches and solutions appropriate to each airport may not be the same and will depend on conditions at each individual airport. Hence, **the strategic criteria may differ from airport to airport.**

§3.39. A partial list of tactical steps [see (a) in the previous paragraph] that may be considered includes:

- Adoption of some of the tactical measures described in Section 2.3 for encouraging slot utilization, such as increasing the current 80% “use-it-or-lose-it” threshold for historic slot series or the required minimum length of a series (to more than 5 slots).
- Stiffer penalties for persistently poor on-time performance and/or for late handing back series of slots.
- Introduction of additional metrics of slot use that reward (up to a point) service with larger aircraft, such as requiring that the number of seats per movement in a slot series not fall below a specified lower limit set by reference to other series serving similar markets.

One of the effects of such measures may be an increase in number of passengers served and in slot mobility, as more slots may return to the slot pool for re-allocation.

§3.40. Direction (b) would introduce allocation criteria of a strategic nature aimed at the second objective – maximizing contribution to the economy and to social welfare. Clearly, setting such criteria is **a task that transcends local coordination**

committees. It can only be performed in consultation with Member States and national-level regulators, with inputs from local and regional government bodies, air transport sector stakeholders, and coordinators. Such high-level involvement is justified by the critical role that Level 4 airports play in regional and national economies.

Strategic criteria of this type would contribute to:

1. Maintaining/strengthening airline competition by facilitating entry of certain types of carriers or the commencement/expansion of service on certain targeted routes.
2. Prioritizing certain types of slot requests that increase the number of passengers that can be served with the given number of slots (e.g., slot series operated by high-capacity aircraft, series of long duration, series serving on long-haul routes).
3. Improving connectivity by:
 - Prioritizing service to new markets.
 - Targeting certain specific regions (e.g., China, India, Africa...).
 - Reserving slots for a specified number of domestic or short-haul routes.

During the allocation process, such criteria would receive precedence over the “normal” allocation criteria for generic Level 3 airports⁹⁶.

§3.41. Finally, under extenuating circumstances, Member States might consider, as part of (b) above, **exceptional strategic interventions** to mitigate problems specific to individual super-congested Level 4 airports. Examples include:

- Restrictions on secondary trading and slot leasing, where these are permitted, to prevent certain carriers from further increasing their slot holdings or unduly strengthening their position at the subject airport.
- Restrictions on access to the slot pool by dominant incumbent carriers.

⁹⁶ Note that, in some cases, these “strategic criteria” may be the same as what are currently called “additional criteria” (Section 2.1) – for example, giving priority to year-round services or to series operated by larger aircraft. In such cases, the precedence of the normally “additional criteria” and of the normally “primary criteria” would be reversed.

- Forced expansion of the slot pool by selecting through an agreed procedure a small percentage (e.g., 3-5%) of historic slots for return to the slot pool each year, for a specified number of years⁹⁷. [Or, equivalently, tagging a block of historic slots with expiration dates, over a horizon of several years.]
- Required divestiture of specified blocks of slots by one or more dominant airlines.

Summary and Conclusion

§3.42. A small but extremely important group of Level 3 airports are operating at saturation or near-saturation levels, meaning that nearly all slots are already occupied during most hours of the busy days of the week. The conditions that prevail today at these “super-congested” airports were not anticipated by the current version of Regulation 95/93, and may require a substantially different approach to slot allocation at these airports than the one now in force.

Should a new class of “Level 4” airports be established, it will be important to limit its membership to a small number of major airports that play a critical role in the European air transport system. To accomplish this, it will be necessary to develop carefully and agree on a clear definition of the conditions and quantitative thresholds that would qualify an airport for designation as Level 4.

For *illustration purposes*, a definition of limited scope that focuses solely on the utilization of runway slots (see §3.33 for details) was applied to a number of pre-selected major Level 3 airports. It was found that, among the airports tested, Amsterdam Schiphol (AMS), Dublin (DUB), Dusseldorf (DUS), London Gatwick (LGW), London Heathrow (LHR), Lisbon (LIS), and, possibly, Frankfurt (FRA) and Munich (MUC) would qualify for Level 4 designation. It is also conjectured that this set of airports would probably qualify under any reasonable alternative definition. A few other airports, for which we did not have data, may also qualify, especially if the definition is extended, as it should, to include other elements of the airport (terminals, aprons) or capacity time scales other than hourly. Obviously, more airports may also join this group should current rates of traffic growth persist.

⁹⁷ This is an example of an intervention whose feasibility depends on resolution of the issue of slot ownership.

To address the issues associated with Level 4 airports, Regulation 95/93 should be amended with provisions that (a) specify the conditions under which an airport would be designated as Level 4, (b) bring about changes that will (i) prevent stagnation in slot occupancy and preserve/strengthen competition and (ii) maximize, to the extent possible, the economic and social benefits generated at these airports. To effect (b), stronger tactical steps should be introduced to increase the mobility of slots and discourage practices that may contribute to waste of capacity. More importantly, Member States in consultation with air transport stakeholders should be able to invoke airport-specific strategic criteria for slot allocation, which coordinators would be required to treat as their primary allocation criteria. If necessary, aggressive regulatory intervention to achieve objectives (i) and (ii) should be an option. Some examples of such criteria and interventions were given in §3.40 and §3.41.

3.4 Allocation of Large Blocks of New Capacity

§3.43. Regulation 95/93 does not at this time draw any distinctions between instances in which the number of slots is increased marginally, e.g., as a result of technological or procedural improvements in air traffic management, and those in which a large block of slots is added because of a major expansion of an airport's infrastructure, such as a new runway or terminal. In the former case the increase in declared capacity is typically of the order of just a few (often 1 or 2) slots per hour. By contrast, a new independent runway at any busy Level 3 airport in the EU would increase the annual runway system capacity of that airport by anywhere from 180,000 to 250,000 movements⁹⁸ (i.e., runway slots) or, in terms of annual passengers, by 20 to 45 million, depending on local circumstances (performance of ATM system, average number of passengers per movement, number of hours of intensive utilization of the airport per day, etc.). Thus, **cases of major, one-step capacity expansion often represent "once-in-a-generation" opportunities to plan strategically for the future of the subject airports and maximize their value as local, national and regional assets.** Given the airport capacity shortfalls facing many parts of the EU, treating such rare instances through business-as-usual processes (as implied by the current version of Regulation 95/93) risks foregoing these opportunities.

Recently announced decisions to initiate capacity expansion projects at a number of major EU airports underscore the importance of addressing this point. A sample of such projects at the busiest Level 3 airports includes three where a new runway will be added within the next 10 years (Dublin by the early 2020s, Vienna by the middle 2020s and London Heathrow by the late 2020s) and another, Frankfurt, where the construction of a major new terminal (Terminal 3) has started. All of these will add many new slots at the subject airports – especially the new runways. Some of these projects will also take place at very "capacity-challenged" airports⁹⁹. The

⁹⁸ These numbers assume a reasonably up-to-date air traffic management system.

⁹⁹ Dublin, London Heathrow and Frankfurt were all in the small group of "super-congested" airports identified in Section 3.3.

way newly created slots are allocated will have long-lasting consequences for the future of these airports.

§3.44. Serious consideration should therefore be given to amending Regulation 95/93 in order to address cases in which a block of new slots becomes available all-at-once at a Level 3 airport. As in the case of super-congested “Level 4” airports (Section 3.3), **the amendments should allow a Member State to invoke airport-specific criteria (depending on local considerations) for allocating the newly available block of slots** at the subject airport, with the objectives of:

- creating conditions for the long-term preservation of a competitive environment¹⁰⁰;
- improving domestic and/or international connectivity; and
- enabling sustainable and sustained growth of traffic at the airport.

In the case of super-congested (“Level 4”) airports (Section 3.3) the available options are severely constrained by the unavailability of open slots, thus requiring aggressive interventions to have any hope of being effective. By contrast, **the pursuit of ambitious strategic options is much more feasible in instances of pending major capacity expansion projects.** In fact, such occasions may also be used to **test innovative approaches to slot allocation.**

§3.45. Recent experience at Frankfurt (FRA), one of Europe’s most important and most congested airports, illustrates some of the opportunities offered by capacity expansion – in this case, as a result of the opening in late 2011 of the new runway 07L/25R, which is used for landings only. Figures 3.2 and 3.3 show the schedule of

¹⁰⁰ In anticipation of the planned opening of the third runway at LHR in the late 2020s, Virgin Atlantic has already requested (September 2019) the use of special slot allocation provisions so it can access a large block of slots and offer service to 84 new destinations, according to Virgin’s announcement. In the words of Virgin Atlantic’s CEO, “changing the way take-off and landing slots are allocated for this unique and vital increase in capacity at the nation’s hub airport will create the right conditions for competition and innovation to thrive.”

<https://www.businesstraveller.com/business-travel/2019/09/18/virgin-atlantic-calls-for-end-of-iag-stranglehold-of-heathrow-slots/>

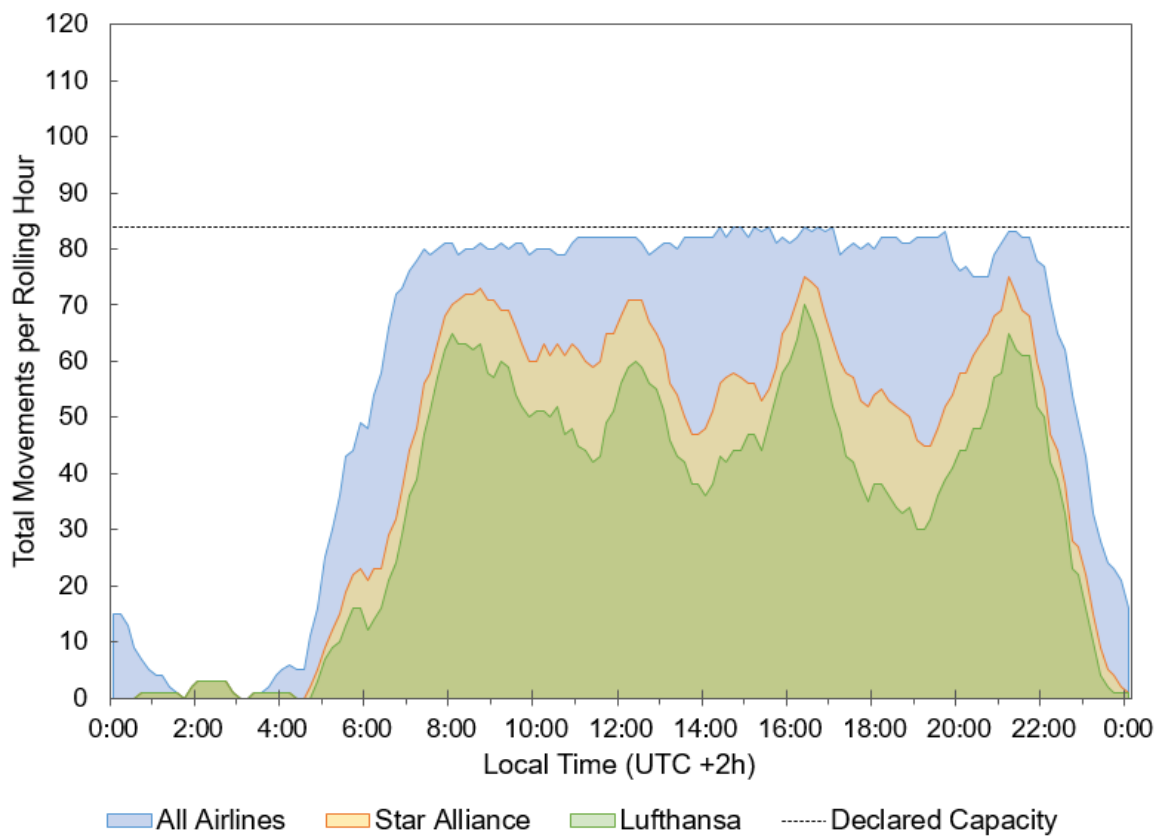


Figure 3.2: Schedule of movements at FRA on a peak day of the S10 season (15/9/2010); the peak declared capacity at the time (available during the afternoon) was 84 movements per hour on a rolling horizon basis; this particular day had 1433 scheduled movements, of which 816 (56.9%) were by Lufthansa and 1011 (70.1%) were by Star Alliance airlines. (Source: Based on data provided by Frankfurt Airport.)

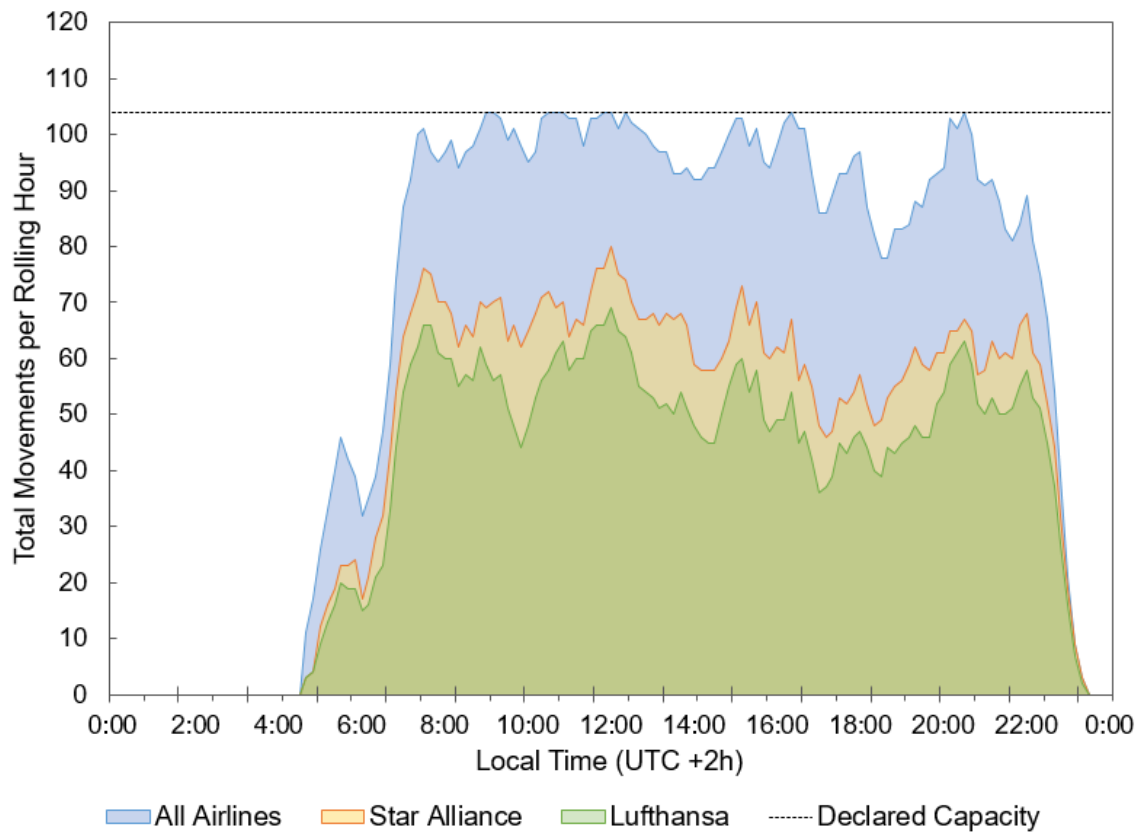


Figure 3.3: Schedule of movements at FRA on a peak day of the S18 season (14/9/2018); the declared capacity was 104 movements per hour on a rolling horizon basis; this particular day had 1600 scheduled movements, of which 887 (55.4%) were by Lufthansa and 1066 (66.6%) were by Star Alliance airlines. (Source: Based on data provided by Frankfurt Airport.)

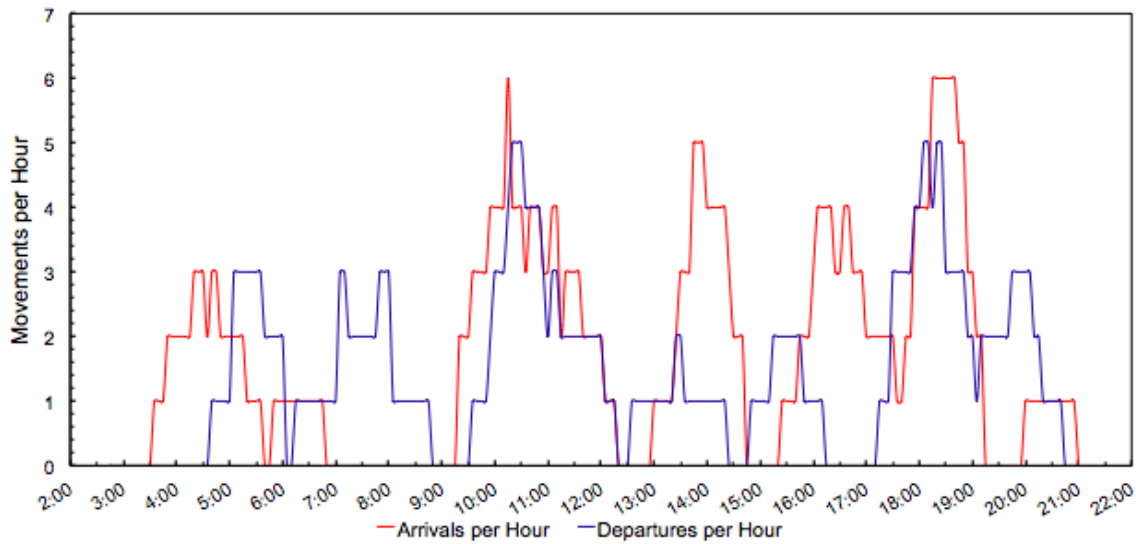
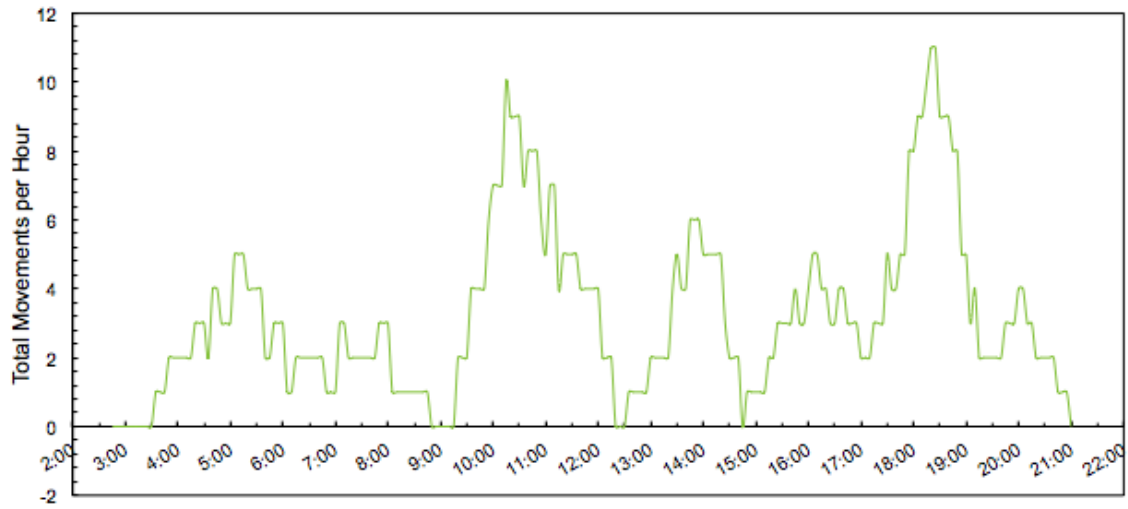


Figure 3.4: A typical schedule of daily movements by Ryanair in FRA during the S18 season (2/4/2018) – total, arrivals and departures; Ryanair operated 59 movements that day – about 4% of the total movements at FRA. (Source: Based on data provided by Frankfurt Airport.)

total runway movements on a peak day at FRA in S10 (the last year before the opening of the new runway) and in S18. Note in Figure 3.2 the virtually complete saturation of the airport throughout the 16-hour “busy operating period” (Section 3.3) of the airport (06:00 – 22:00 local time). Following the opening of the new runway, the declared capacity of the runway system eventually increased by 20 movements per hour (or by 24%), from 84 in S10 to 104 in S18. As a result (Figure 3.3) the schedule of movements took by S18 a more “normal” shape, exhibiting mild peaks and valleys that reflect the scheduling preferences of airlines. The dominance of Lufthansa and the Star Alliance also became somewhat less pronounced despite the fact that Lufthansa increased the number of its movements by 71 (or by 9%), from 816 to 887 on the peak days of S10 and S18, respectively, and the Star Alliance airlines by 55, from 1011 to 1066, or by 5%. The large increase in the number of slots also made it possible for Ryanair, an airline that did not operate at FRA until 2017, to develop a significant presence there, serving 24 markets from/to FRA and operating roughly 4% of all movements at the airport by S18 (Figure 3.4) and as many as 11 movements in a one-hour period. These developments demonstrate the benefits of significant increases in capacity at Level 3 airports. In this particular case, no special rules were used by the relevant coordinator (FLUKO – Airport Coordination Germany) to effect slot allocation at FRA, following the opening of the runway. However, the airport operator (Fraport) offered a package of discounts and incentives on airport charges to Ryanair, an initiative that was strongly criticized by Lufthansa¹⁰¹.

Finally, it is noted that, as a result of strong traffic growth and much latent demand, slots are becoming scarce again at FRA and the airport remains in the ranks of “super-congested” airports (Section 3.3), confirming the point that events like the 2011 opening of the new runway represent rare opportunities to plan strategically for the future of a Level 3 (or Level 4) airport. In fact, **one of the main objectives of the mechanisms and strategic planning measures outlined in the next**

¹⁰¹ <https://www.aero.de/news-25349/Ryanair-startet-ab-Maerz-in-Frankfurt.html>

paragraph should be to avoid (or, at least, delay) a return to slot saturation soon after the addition of sizable new capacity.

§3.46. Listed below are examples of strategic measures that might be adopted to guide slot allocation in cases in which a large block of new slots becomes available all-at-once due to capacity expansion. An analogous set of examples, in a similar spirit, is presented in Paragraphs 3.56 – 3.58 of *Aviation 2050: The Future of UK Aviation* (UK Department of Transport, 2018) in the context of the expected construction of London Heathrow’s third runway. As already noted, such measures also partially overlap with strategic measures suggested for “Level 4” airports in Section 3.3.

- i) Assign priority to requests by new entrants (NE) over requests for changes to historic slots.
- ii) “Relax” the definition of “new entrant” so that a NE may request a significantly larger share of the newly created slots than is possible under the current Article 2(b) of Regulation 95/93; note that, in this way, some **incumbents currently holding a small number of slots at the subject airport may qualify for additional slots as NEs.**
- iii) Apply special measures that **would increase slot mobility and preserve it in future years**, while avoiding disruption of operations. For instance, tag a subset of the newly created slots with expiration dates that are spread over an extended horizon (e.g., 20) of years. This is equivalent to limiting the grandfathering period to ensure a steady turnover of some slots throughout the selected time horizon.
- iv) Along similar lines, select through a transparent procedure a small percentage (e.g., 3-5%) of historic slots for return to the slot pool each year for reassignment.
- v) **Designate blocks of the newly created slots for assignment** to domestic or regional markets in order to preserve/enhance local connectivity, or to new, long haul connections in order to improve international connectivity, possibly targeted to certain promising markets.
- vi) **Test potential market-based allocation mechanisms**, such as:

vi.1) Auction a limited number of newly-created slots – keeping the number small will reduce the practical complexity of slot auctioning¹⁰² and offer an opportunity for an initial test of this much-discussed and controversial approach¹⁰³.

vi.2) Make available for multi-year lease (sufficiently large) blocks of slots that would make it possible for airlines to establish a viably sized operation at the subject airport.

vi.3) Offer for multi-year lease pairs of slots (for an arrival followed by a departure) at prices that depend on the time-of-day associated with each pair – this is a simplified form of congestion pricing.

Note that **the feasibility, as well as the effectiveness of some of the strategic measures (e.g., expiration of slots, auctioning of slots) listed above depends on the resolution of the question of ownership rights associated with slots** (Section 3.2).

§3.47. Whenever a major increase in the capacity of a Level 3 airport is imminent (e.g., two years before the large block of additional slots becomes available), it should be mandatory to perform a detailed study on whether the subject airport should retain its Level 3 designation after the expansion. This study would test the applicability of Article 3(7) of Regulation 95/93 that states: *“When a capacity sufficient to meet actual or planned operations is provided at a coordinated airport, its designation as a coordinated airport shall be lifted.”*

To use a somewhat extreme example, if a Level 3 airport with a single runway is expanded through the construction of a new independent runway – essentially

¹⁰² In the view of this author, the large-scale auctioning of airport slots would be extremely complex technically and very difficult to apply in practice [see Section 12.5 in de Neufville and Odoni (2013) for details]. As of now, there is really no such practical experience anywhere. Any initial test of slot auctions should therefore be conducted under special circumstances and on a small scale. Such a test will certainly be instructive for both proponents and opponents of slot auctions.

¹⁰³ In 2008, the FAA presented a detailed proposal for an auction of slots at Newark Airport in connection with delay mitigation at the airport (FAA, 2008); the proposal met with strong opposition from the airlines and was not implemented.

doubling its capacity – it is very likely that the airport could be re-designated as Level 1. The new airport of Athens, for instance, changed its designation from Level 3 to Level 1 some years after its 2001 opening. Following the change, the airport has been able to attract many new airlines and add service to multiple destinations, while imposing minimal constraints on the timing of flights.

The study to reconsider the Level 3 (or, possibly, “Level 4”) designation following expansion should be objective, transparent and use state-of-the-art methodology, as some stakeholders may be affected negatively by any change to a Level 2 or Level 1 designation. A possible example of negatively affected stakeholders is incumbent carriers holding many historic slots at the subject airport. The most logical interpretation¹⁰⁴ of Regulation 95/93 is that **the notion of “grandfather rights” to historic slots exists only in the context of coordinated (Level 3) airports.** Therefore, changing the designation of an airport from Level 3 to Level 1 (and possibly even to Level 2) would mean that incumbents would lose their historic slot rights and any benefits these rights imply.

Summary and Conclusion

§3.48. Regulation 95/93 does not draw a distinction between instances in which the declared capacity of a Level 3 airport is increased marginally and those in which a large block of slots is added because of a major expansion of an airport’s infrastructure, such as a new runway or terminal. However, these two situations actually differ greatly, with the latter offering the rare opportunity to plan strategically for the future of the subject airport, especially in cases where the airport previously operated at a level close to saturation.

Serious consideration should therefore be given to amending Regulation 95/93 in order to address cases in which a large number of new slots become

¹⁰⁴ The Regulation is not explicit on the subject of what happens to “slots with historic precedence” if an airport’s status is changed from Level 3 to Level 1. However, Article 2(a) defines a slot as a “permission given by a coordinator in accordance with this Regulation”. It is therefore reasonable to assume that a “slot” does not exist in the absence of a coordinator, i.e., at Level 1 airports (and even at Level 2).

available all at once at a Level 3 airport. The amendments should allow a Member State to invoke or specify airport-specific criteria for allocating the newly available block of slots with the objectives of: creating conditions for the long-term preservation of a competitive environment; improving domestic and/or international connectivity; and enabling sustainable growth of traffic. Occasions of major capacity expansion may also be used to test innovative approaches to slot allocation. Examples of such criteria and approaches that span a range of possibilities are given in §3.46. The feasibility and effectiveness of some of these depend on the resolution of the question of slot ownership and associated rights.

Finally, whenever a major increase in the declared capacity of a Level 3 airport is imminent, it should be mandatory to perform an objective, transparent and detailed study, using state-of-the-art methodologies, on whether the subject airport should retain its Level 3 designation following expansion or should be re-designated as Level 2 or even Level 1.

3.5 Transparency

§3.49. One of the most common and persistent criticisms of the slot allocation process at Level 3 airports is that it is not sufficiently transparent. The criticism is directed at several aspects of the process. **Three different general areas can be identified for substantial improvement:**

(a) Clarity of parts of Regulation 95/93.

(b) Transparency of allocation decisions.

(c) Access to data and dissemination of information of public interest.

Each of these is discussed briefly below.

§3.50. **Clarity of parts of Regulation 95/93:** In 2008, the Commission issued Communication COM(2008) 227 that contained a number of clarifications dealing with important aspects of Regulation 95/93, such as the independence of coordinators, new entrants, transparency, local guidelines, and secondary trading. However, the Regulation still contains ambiguities or has gaps that are filled in practice by resorting (by default) to the WSG or by interpreting them locally, as already noted at several points in this report. It therefore seems necessary to **initiate an effort aimed at reviewing the text of Regulation 95/93 to identify points that may be ambiguous or require elaboration. Such points should be clarified, either by amending the Regulation itself or through a Communication similar to the one issued in 2008.** A small sample of the many points that could be addressed might include the following:

Conditions for airport coordination: The conditions, as described, in Article 5(3), stipulate that an airport will be eligible for Level 3 designation if “(a) the shortfall [in capacity] is of such a serious nature that significant delays cannot be avoided at the airport, and (b) there are no possibilities of resolving these problems in the short term”. This is exceedingly vague. Clearly, the Regulation should provide some latitude to the Member States in determining what level of congestion would necessitate an intervention into the scheduling practices at any given airport. However, terms such as “significant delays”, “resolving these problems” and “short term” leave too much room for interpretation and may have contributed to

unnecessary proliferation of the “Level 3” designation at some member states – see Table 1.3 and Section 3.6. The Commission should consider providing further guidance on this point or even specifying certain reasonable benchmarks.

“Re-timing” of historic slots: A request for a series of slots that is deemed to constitute a “re-timing” of a historic series enjoys the important advantage of being accorded priority over requests by new entrants and other carriers. The relevant Article 8(4) describes the conditions under which a historic series can be “re-timed” as follows: *“Re-timing of series of slots ... shall be accepted only for operational reasons or if slot timings of applicant air carriers would be improved in relation to the timings initially requested.”* This requires further clarification. In practice, different coordinators seem to interpret these conditions differently, while airlines naturally consider any change they propose to a historic slot as an “improvement”, thus qualifying for “change-to-historic” status and for priority over other slot requests.

“Additional criteria”: As already noted – and in contrast to the WSG – Regulation 95/93 does not list or make reference to any “additional criteria” for slot allocation. However, it states explicitly that *“The coordinator shall also take into account additional rules and guidelines established by the air transport industry world-wide or Community-wide, as well as local guidelines proposed by the coordination committee and approved by the Member State...”* [Article 8(5)], while being entirely silent on how such additional criteria should be applied, weighted or prioritized, especially in cases in which more than one requests are competing for the same slot. As a consequence, coordinator practices seem to vary considerably in this respect, including instances in which certain “additional criteria” are treated as superseding primary criteria. Providing clarity regarding the treatment of additional criteria should be considered a priority.

“Airport system”: A “new entrant” [Article 2(b)] is defined, in part, as an airline that holds fewer “than 4% of the total slots available on the day in question in an airport system of which that airport forms part”. Traditionally, all commercial airports serving a particular metropolitan area have been treated as belonging to the same “system”. However, growing airport privatization may give rise to more cases like London’s, where airports under different ownership are competing for shares of

traffic. In addition, in its Air Berlin/EasyJet ruling, the Commission acknowledged that Berlin's Tegel (TXL) and Schoenefeld (SXF) airports serve different markets and compete against each other. Should such competing airports be considered parts of the same "airport system"? It is also noted that the 2011 Proposal eliminates completely the "airport system" restriction in the definition of "new entrant". This is another point that requires clarification.

§3.51. **Transparency of allocation decisions:** Another recurring complaint is that **the rationale for certain allocation decisions is often not transparent to stakeholders** (airlines and airports). This seems to be a particularly widespread concern for cases where "additional criteria" are applied to resolve instances in which two or more carriers are competing for the same slot. To cite one example, it was unclear to a stakeholder "what additional criteria were used, what was the information that the coordinator's decision was based on, and how the criteria were applied and weighted". While, this seeming lack of transparency may be largely a consequence of the absence of detailed guidelines in Regulation 95/93 (and in the WSG) regarding the application of additional criteria (as already mentioned in the previous paragraph), it is also true that this is widely perceived as a problem.

Also mentioned are instances in which different coordinators seem to interpret differently some rules or practices. One such example – noted in Section 2.3.1 – is the "double-dip" practice, which some coordinators are said to find acceptable, while others do not. The extent to which this loophole is used in practice is also unclear, due to lack of detailed explanation of some allocation decisions.

Another criticism is that stakeholders are not consulted adequately regarding the implications of certain allocation decisions that could have been better resolved were coordinators aware of additional available information. For instance, a typical complaint from airport operators is that they are given information about slot requests only *after* the allocations have been made, thus depriving them of the opportunity to advise coordinators about additional points or data that should be considered.

Perceptions about the transparency of the process may also vary greatly from airport to airport depending on the resources available to the local coordinator.

Some coordinators may not have sufficient resources to respond adequately to stakeholder inquiries. **Making sure that coordinators are provided with adequate resources for this purpose is probably the most effective way to deal with the issue of transparency of slot allocation decisions.**

§3.52. **Access to data and dissemination of information of public interest:** Level 3 airports are critically important in the 32 States where Regulation 95/93 is in force. The slot allocation process that is applied at these airports poses significant barriers to entry into air transport markets and thus interferes with the functioning of a free and competitive market – especially so at those airports where the scarcity of slots is most severe. The dissemination of information about developments at Level 3 airports and easy access to related detailed data are therefore very much in the public’s interest. There is much room for improvement on both of these fronts.

When it comes to detailed data, only a limited amount is currently readily accessible through coordinator websites or other sources. To our knowledge, only a single website (Online-Coordination.com) provides generally accessible, fine-granularity data on slot availability at a large subset of Level 3 airports. These are the airports that are associated with a group of European coordinators who are collaborating with the site. That same website and several others (EUACA.org, and websites operated by various coordinators) can also provide additional and more detailed data, but access to these sites is password-protected and limited to immediate stakeholders. Academic and industry experts and other interested parties must therefore often go through time-consuming and frequently unsuccessful efforts to request and obtain such data. Some coordinators apparently treat parts of or all such information as confidential and provide it selectively. Yet, easy access to the data would contribute significantly to addressing many issues related to the Regulation and to the slot allocation process in an informed and impartial manner.

On the side of the general public, widely disseminated information is largely missing today. There is little or no awareness (even among leading decision-makers) of issues related to Level 3 airports, to the scarcity of slots, and to the need for additional capacity at many of the EU’s main connection points to the rest of the world.

Both of these problems (public awareness, availability of detailed data) would be resolved if Article 4(8)¹⁰⁵ of Regulation 95/93 were to be replaced by Article 6 (“*Transparency of coordination activities and schedule facilitation*”) of the 2011 Proposal. In particular, that Article’s paragraphs 3 and 4 state:

“3. The coordinator shall maintain an up-to-date, freely-accessible electronic database containing the following information:

(a) historical slots by airline, chronologically, for all air carriers at the airport;
(b) requested slots (initial submissions) by air carriers and chronologically for all air carriers;

(c) all allocated slots, and outstanding slot requests, listed individually in chronological order, by air carriers, for all air carriers;

(d) remaining available slots with respect to each type of constraint taken into consideration in the coordination parameters. The database shall allow air carriers to verify the availability of slots corresponding to their requests;

(e) slots transferred or exchanged, indicating the identity of the air carriers involved and whether the transfer or exchange was made for compensation of a financial or other nature. Aggregate data on financial compensation shall be published each year;

(f) full details on the coordination parameters.

This information shall be updated regularly.

4. The coordinator shall ensure that the data are stored and remain accessible for at least five consecutive equivalent scheduling periods.”

¹⁰⁵ The original text of Article 4(8) of Regulation 95/93 (paragraph 7) stated: [italics added]: “*the coordinator shall, on request and within a reasonable time, make available for review to **all interested parties** the following information...[detailed list of data items follows]*” [bold added]. The same Article 4(8) was subsequently amended through Regulation (EC) No 793/2004 to state (paragraph 8) [italics added]: “*... for review to **interested parties, in particular to members or observers of the coordination committee** ...[same detailed list of data follows]*” [bold added]. The amendment thus greatly limited the original mandate for data accessibility. Article 6 of the 2011 Proposal would restore the original intent of the regulation.

It will be noted that none of the data items mentioned in the above Article 6(3) of the 2011 Proposal could reasonably be considered to constitute privileged information.

It is, of course, assumed here that coordinators will be provided with adequate resources for the tasks of maintaining the above databases and generating the related reports.

Summary and Conclusions

§3.54. One of the most common and persistent criticisms of the slot allocation process at Level 3 airports is that it is not sufficiently transparent. Three different areas can be identified for substantial improvement:

- a) The text of Regulation 95/93 should be reviewed in detail and any points deemed ambiguous or requiring further elaboration should be clarified, either by amending the Regulation or through a Communication similar to the one issued in 2008.
- b) Stakeholders (especially airlines and airports) should be able to obtain explanations for the rationale of certain allocation decisions, especially in cases where “additional criteria” are applied to resolve instances in which two or more carriers are competing for the same slot. Coordinators should be given adequate resources for the task of responding to inquiries of this type. Better lines of (occasionally proactive) communication with coordinators would also be helpful.
- c) Dissemination of information about developments at Level 3 airports and easy access to related detailed data are very much in the public’s interest. To achieve these objectives Article 6 of the 2011 Proposal should be adopted and should replace Article 4(8) of Regulation 95/93. The online posting by coordinators of annual reports on developments at the Level 3 airports for which they have responsibility should be a requirement. The reports should contain the freely accessible information specified in Article 6 of the 2011 proposal, and adequate resources for this task should be made available to coordinators.

3.6 Declared Capacity

Background

§3.55. The first step in the Slot Allocation Process at any Level 3 airport is the setting of the airport's **declared capacity**¹⁰⁶, or, in slot allocation terminology, "**coordination parameters**". This is a critically important step, as it determines the "supply" side of the process, i.e., how many slots (=capacity) will be made available to the airlines and, by extension, to consumers.

It is important to recognize at the outset that **"declared capacity" is not a readily measurable quantity, but an agreed "benchmark" - a "target" - for schedule planning purposes.** This benchmark must be specified months in advance of when the scheduled operations will actually take place. For example, the declared capacity of an airport may have been set at 72 movements per hour but, on the day when any particular operation actually takes place, the **true operating capacity** may be 80 per hour, if the weather conditions are good, or 68 per hour if the weather conditions are not favorable. More generally, the true operating capacity of an airport at the time when actual operations take place may be significantly different from the declared capacity and may depend on weather conditions, the combination of runways that are in use, the mix of aircraft types operating at the time, the mix of arrivals and departures, etc. Unpredictability exists even on the side of passenger terminals and apron operations, including gate availability, staffing issues, passport and security control bottlenecks, etc. Thus, **the declared capacity (the "benchmark") must be set in the face of uncertainty, taking into consideration the full range of true operating capacities that may materialize in practice and the relative frequency (= probability) with which they materialize.** Moreover,

¹⁰⁶ In this section, the term "declared capacity" will refer to the entire set of capacity limits specified at any Level 3 airport in advance of each Summer or Winter season. This set (see also Section 2.1) may consist of only a single limit (most often on the number of movements that the airport's runway system will handle per hour) or a set of several limits, each pertaining to different elements of the airport (runway system, aprons, terminals, etc.) or to different types of traffic (landings, takeoffs, arriving passengers, etc.). Declared capacities are often referred to as "coordination parameters" by those engaged in the slot allocation process.

one must also consider **the trade-offs between capacity utilization and level of service** (as reflected in delays and on-time performance). Setting the declared capacity at too high a level relative to the range of true operating capacities will mean very intensive utilization of the true operating capacity, but also frequent periods of time when the true operating capacity will be lower than the number of scheduled operations, thus leading to congestion and poor on-time performance. On the other hand, setting the declared capacity too low will ensure mostly delay-free operations and good on-time performance, but will also waste valuable additional true capacity that may be available under many operating conditions; it may also force the rejection or displacement of many slot requests during the slot allocation process, thus interfering strongly with the flight scheduling preferences of airlines – especially in the case of new entrants and of additional requests by incumbents at Level 3 airports¹⁰⁷.

§3.56. The complexity that the variability of true operating capacity introduces when setting the declared capacity of an airport is illustrated by the following example: Figure 3.5 is based on extensive historical data from BOS, Boston’s Logan International Airport (de Neufville and Odoni, 2013). It shows the range of values that the true operating capacity of BOS can take and the percent of time this capacity is available. It can be seen that for roughly 61% of the time, i.e., when the airport operates under ideal weather conditions, BOS can handle about 130 movements (arrivals and departures) per hour. But under different weather conditions, the true operating capacity may be reduced to 115 movements per hour (for about 16% of the time), or 96 (10% of the time), 75 (5%), and 56 movements per hour. This latter capacity is observed under poor weather conditions that prevail about 6% of the

¹⁰⁷ An additional technical complication in setting declared capacity is that if, as is usually the case, this capacity is expressed in terms of operations per unit of time (such as aircraft movements per hour), the eventual composition of the traffic served will itself influence the capacity. For example, in the case of runway capacities, different aircraft types require different separations. Thus, if the traffic includes a large number of wide-body aircraft, which require larger separations, the number of aircraft movements per hour (i.e., the capacity) will be reduced.

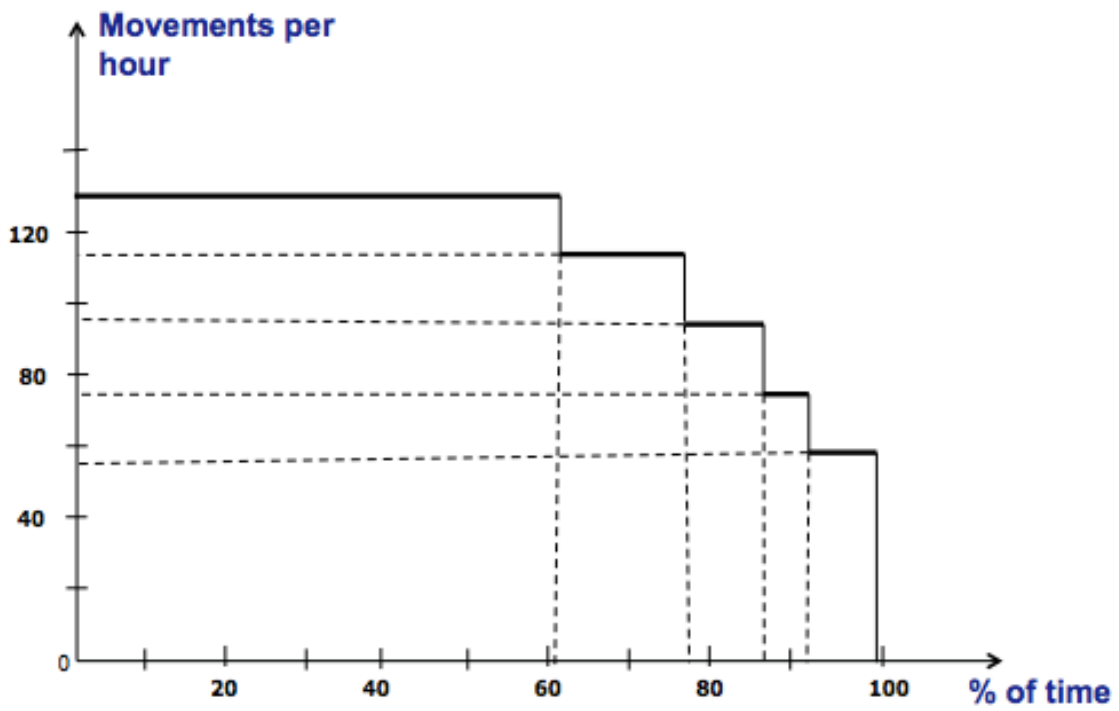


Figure 3.5: Annual availability of true operating runway capacity at Boston's Logan International Airport (BOS).

time in BOS¹⁰⁸ and force the airport to operate with essentially a single active runway.

What capacity should then be declared for BOS? A very “optimistic” choice would be to set it close to the highest achievable capacity of 130 movements per hour, for instance, to 125. As a result (and assuming there is sufficient demand) the airport would serve a very large volume of traffic, but would fall short – sometimes very short – of providing adequate capacity for some 39% of the time, with consequent very long delays on truly “bad” days. At the opposite extreme, a very “conservative” approach would set the declared capacity to, e.g., 55 movements per hour. This would ensure a virtually delay-free operation year-round (as the scheduled number of movements would essentially always be below the true operating capacity of the airport), but would also waste a huge amount of available additional operating capacity on all but the worst weather days. A purportedly more “scientific” approach would set the declared capacity to a value close to the “weighted average” of the capacities shown in Figure 3.5 or to about 114 movements per hour. But this would still mean very long delays during periods when the operating capacity falls as low as 75 or 56 movements per hour. Airlines and airport users would probably find such delays unacceptable, even if they occurred only occasionally. Similar arguments can be made about selecting any value in the range between 56 and 130 as the declared capacity. (End of example.)

§3.57. In summary, **the setting of the declared capacity of a Level 3 airport is a complex task that requires careful analysis, understanding the tradeoffs among different performance objectives and, eventually, reaching a consensus of the stakeholders involved regarding the appropriate value(s) of the coordination parameters.** The complexity of the task will vary with: the size of the airport; the variability of weather conditions; the geometric layout of the runways

¹⁰⁸ Note in Figure 3.5 that, for about 1% of the time, the runway capacity of BOS is zero, due to extreme weather conditions such as snowstorms, heavy snow accumulation, and severe thunderstorms.

and of the airfield¹⁰⁹; and the number and configuration of terminals, aprons, and gates. The complexity (and best value) will also depend on the characteristics of the demand, such as seasonality and variability by time-of-day.

Current Practice

§3.58. Today's practices regarding the setting of declared capacity appear to vary greatly across Level 3 airports in Europe and in the world. While, in some cases, advanced methods and tools are employed, there are also instances in which the approaches used are inadequate or simplistic. A common problem is failure to evaluate in depth and find the right balance between, on the one hand, increasing the volume of traffic served and, on the other, maintaining an acceptable level of service (as measured by delays) and ensuring environmental compatibility. In this respect, the declared capacity at some Level 3 airports would appear to be set at an excessively low level, reflecting the desire to minimize delays¹¹⁰ and achieve high on-time performance. This may, in turn, reflect a mistaken assumption that any air traffic delays are undesirable. It is well known, however, that **efficient utilization of any facility where demand and/or capacity are subject to uncertainty (as is very much the case at airports) cannot be achieved unless the facility's users experience a certain level of expected delay** – the more valuable the facility's service to its users, the higher the optimal level of delay. The most sophisticated airport operators apply exactly this type of reasoning when setting their declared capacity.

¹⁰⁹ BOS is an example of a particularly complex case because of the wide range of possible operating capacities due to the presence of six runways with three different orientations, occasionally extreme weather conditions, shifting wind directions and several environmentally driven restrictions on the use of some of the runways. But analogous considerations are at play (about the full range of true operating capacities, about the tradeoffs between declared capacity and level of service) even at the most simply configured airports, such as those with a single runway and terminal building.

¹¹⁰ Issues with air traffic management personnel also contribute occasionally to setting declared capacity at a level well below the ATM system's true ability to process airport traffic.

A related issue is that the benefits of increases in declared capacity are sometimes insufficiently appreciated. First, and most obviously, such increases make it possible to utilize more intensively the available airport resources and thus process a larger volume of traffic. For example, London Heathrow, where the average number of passengers per runway movement (arrival or departure) in 2018 was 168 could serve roughly 1 million more passengers per year¹¹¹ with each increase of just a single slot per hour in its declared capacity¹¹²!

Second, *ceteris paribus*, increases in declared capacity reduce the overall displacement of slot requests. In other words, the time that will ultimately be assigned to a slot request will be closer, on average, to the time originally requested by the airline. Obviously, this is because a greater declared capacity opens up more slot allocation possibilities for coordinators, thus enabling slot assignments that require less displacement than previously. Recent papers (Ribeiro et al, 2019b; Zografos et al, 2012) demonstrate how even small increases (e.g., by one or two slots per hour) may lead to striking reductions in displacement.

§3.59. Table 3.12 presents the results of a survey of the declared capacities of the runway systems of 28 major Level 3 airports in the EU, Norway and Switzerland in 2003, 2007 and 2019. The reader is cautioned against making simplistic comparisons between the declared capacities of the different airports listed in Table 3.12. The runway systems of these airports span a wide range of geometric layouts and of number of active runways during peak hours. They also serve different mixes of aircraft types and are operated by different air navigation system providers. Care

¹¹¹ We assume that the additional slot will be used for 16 hours per day for 365 days ($16 \times 365 \times 168 \approx 981,000$), consistently with the current level of slot utilization at LHR (see Section 3.3). At other busy Level 3 airports, with a smaller number of passengers per movement, the marginal increase per additional slot in the number of annual passengers would be smaller, but almost certainly in the range of 500,000 to 1 million.

¹¹² Hence the claim that the proposed third runway at LHR, which would increase the number of slots by about 40-45 movements per hour, would also increase the airport's capacity by 40 or more million passengers per year.

City	Airport	2003 ¹	2007 ²	2019 ³	Δ (2019-2003)	Δ (2019-2007)
Amsterdam	AMS	106	106	106/110	4	4
<i>Barcelona</i>	<i>BCN</i>	52	62	78	26	16
Berlin	TXL	35	48	52	17	4
Brussels	BRU	70	74	74	4	0
Copenhagen	CPH	83	83	83	0	0
Dublin	DUB	44	46	48	4	2
Dusseldorf	DUS	38	45	45	7	0
<i>Frankfurt</i>	<i>FRA</i>	78	83	104	28	21
Geneva	GVA	36	36	36	0	0
Hamburg	HAM	52	53	48	-4	-5
<i>Helsinki</i>	<i>HEL</i>	50	80	80	30	0
Lisbon	LIS	30	36	40	10	4
London	LGW	50	50	55	5	5
London	LHR	86	89	90	4	1
London	STN	42	46	50	8	4
<i>Madrid</i>	<i>MAD</i>	78	90	100	22	10
Manchester	MAN	59	59	59	0	0
Milan	MLX	70	69	70	0	1
Munich	MUC	86	90	90	4	0
Oslo	OSL	80	80	80	0	0
Palma	PMI	60	60	66	6	6
Paris	CDG	101	112	112	11	0
Paris	ORY	76	72	70	-6	-2
Rome	FCO	90	88	90	0	2
Stockholm	ARN	76	80	84	8	4
Stuttgart	STR	36	42	42	6	0
Vienna	VIE	66	66	68	2	2
Zurich	ZRH	66	68	66	0	-2

Table 3.12: Declared total hourly capacity (= movements per hour) of the runway systems at 28 major Level 3 airports in 2003, 2007 and 2019.

Sources:

¹ (Primarily) Forsyth et al (2007);

² (Primarily) Morisset (2010);

³ Coordinator websites/reports (obtained with assistance of F. Wister, Chair, EUACA).

Notes:

(a) New runways were opened at FRA, MAD, BCN and HEL between 2003 and 2019.

(b) AMS maximum hourly capacity: 106 in arrival peaks and 110 in departure peaks.

(c) For one morning hour (07:00-07:59) CDG's declared capacity was 120 movements.

(d) DUS and FRA have an allowance for up to 2 General/Business Aviation movements per hour (in addition to 45 for scheduled and charter flights), while STR has a similar allowance for up to 6 movements per hour (3 arrivals, 3 departures).

(e) HAM first became a Level 3 airport in 2017.

should therefore be taken to understand the conditions that apply to each case and to limit comparisons to comparable airports.

The last two columns of Table 3.12 show the difference between the declared capacities in 2003 vs. 2019 and in 2007 vs. 2019, respectively. Only the limits on **the total number of runway movements that can be scheduled per hour** at each airport are shown. However, many of these airports also have declared capacities for arrivals only, for departures only, and for periods of time other than 60 minutes (e.g., per 10, 20, or 30 minutes). Moreover, in several cases, there are limits on passengers arriving and/or departing at/from terminals, on the number of aircraft at gates, etc. Thus, Table 3.12 presents only a very partial picture of the evolution of declared capacities at the subject airports between 2003 and 2019.

Nonetheless, the message that the table conveys is quite clear. With the exception of the four airports that have benefitted from a new runway during the period 2003-2019 (Frankfurt, Madrid, Barcelona and Helsinki), increases in the declared capacity of the runway systems have been modest. For instance, between 2007 and 2019, the **net total** change in the declared capacities of the 24 airports that did not add a new runway (i.e., the sum of the changes shown in the rightmost column of Table 3.11, excepting FRA, MAD, BCN and HEL) was +30 or, an average, only 1.2 (= 30/24) more slots per hour per airport in 12 years. Absent new built infrastructure, increases in runway capacity must come from improvements (technology and procedures) in air traffic management. Table 3.12 suggests that advances in the efficiency of the air traffic management system that may have been achieved during these years as a result of the SESAR undertaking and other programs and initiatives, have not been translated, to date, into particularly significant increases in the capacity that is made available at the most congested airports. Another contributing factor to the slow pace of increase may be the fact that the share of wide-body aircraft in the fleets of aircraft at some of the airports in Table 3.12 has increased during the years in question. As wide-body aircraft require longer separations on landing or taking off, this may have affected negatively the capacities of this particular subgroup of airports.

On the positive side, the runway systems of several of the airports listed in Table 3.12 are currently operating with remarkable efficiency¹¹³, ranking among the best in the world in this respect.

Overall, there is a need for **a detailed study aimed at understanding better the factors that may be contributing to the slow pace at which new slots at EU Level 3 airports are created**. While, in some cases, it is clear that environmental constraints have been primarily responsible for the absence of increases, a complex combination of technical and non-technical causes may be at play in other instances.

Best Practices

§3.60. Articles 3 and 6 of Regulation 95/93 address the issues of designating an airport as Level 3 and of setting its declared capacity. Article 3(3), only calls for Member States to perform an analysis which, “*based on commonly recognised methods*, shall determine any shortfall in capacity, taking into account environmental constraints at the airport in question” [*italics added*]. Moreover, it is stated that the Member State shall designate the airport as Level 3, “only if: (a) the shortfall is of such a serious nature that *significant delays* cannot be avoided at the airport, and (b) there are no possibilities of resolving these problems in the short term” [Article 3(5), *italics added*]. Article 6 (“Coordination Parameters”) makes no further statements pertaining to the analysis and methods for setting the declared capacity. **The failure to be more specific on what constitutes “significant delays”¹¹⁴ and on acceptable methods of analysis has undoubtedly contributed to the extensive**

¹¹³ A partial list of airports in Table 3.12 that have achieved high, by any standard, declared capacities would certainly include: MUC (two independent parallel runways) with a declared capacity of 90 movements per hour; LHR (two independent parallel runways) with up to 90 in some hours, despite the presence of a very large percentage of wide body aircraft; CPH (pair of close parallel runways) with 83 per hour; and LGW (single runway) with 55 per hour.

¹¹⁴ Footnote 86 provides an example of quantitative thresholds developed by the FAA for defining “significant congestion” and “severe congestion”. Several airport operators and airlines have also addressed over the years the question of specifying what is and is not an “acceptable” level of air traffic delay at an airport (de Neufville and Odoni, 2013).

use of the Level 3 designation in Europe and to the diversity of operating conditions that can currently be observed at these airports.

§3.61. As already noted, a number of Level 3 airports have by now developed sophisticated approaches for determining and setting their declared capacity (or, coordination parameters). In addition, ongoing and recent research has made available a number of powerful models and advanced software tools for supporting the capacity declaration process. They could be instrumental in addressing the weaknesses of some current practices described in §3.58 and §3.59.

We summarize here the principal guidelines concerning capacity declaration at Level 3 airports that have emerged to date from experience with these advanced approaches and tools¹¹⁵:

- (i) **Declared capacity should take into consideration the full spectrum of operating conditions observed at the airport** (e.g., good/poor weather, different runway configurations, high and low season requirements, etc.). Focusing, e.g., solely on poor weather conditions risks declaring overly conservative capacities that result in unnecessarily low scheduling levels; focusing on good weather alone can lead to excessive delays in poor weather.
- (ii) **Declared capacity should preferably be specified at high levels of granularity.** For instance, the increasingly common practice of declaring separate limits for arrivals and for departures, or of specifying separate runway, terminal and apron declared capacities, often leads to a better matching of scheduling levels with the airport’s operating capabilities.
- (iii) It has been common practice to declare a “flat” capacity throughout the principal busy hours of each day – for instance, “80 movements per hour from 06:00 to 22:00”. However, **consideration should be given to declared capacities that vary from one period of the day to another** so that higher volumes of operations can be accommodated in certain peak hours. Higher loads during some peak hours can be compensated, in part, by “valleys” in the

¹¹⁵ For a detailed discussion, see Gillen et al (2016) and Jacquillat and Odoni (2015a). The summary provided here is based on Ribeiro et al (2019b).

schedule at other hours. This practice may reflect well and match airline preferences, while still maintaining a high level of service. Declared capacities that vary by time-of-day are increasingly being used at some of the busiest Level 3 airports (e.g., Amsterdam Schiphol, London Heathrow, Paris CDG).

- (iv) More generally, **it is important to consider the time-of-day patterns of demand when setting declared capacities** – don't just look at the supply side. By considering demand and capacity simultaneously, declared capacities can be set at values that achieve a targeted level of service and take account of the nonlinear relationship between delay and airport utilization.
- (v) **The tradeoff between delays and marginal changes in declared capacities (higher declared capacities mean higher delays and vice versa) should be fully explored.** Airlines and airport users may well prefer somewhat higher average delays in exchange for more slots and smaller displacement of slot requests.

Summary and Conclusion

§3.62. The first step in the Slot Allocation Process at any Level 3 airport is the setting of the airport's "declared capacity", or "coordination parameters". This is a critically important step, as it determines the "supply" side of the process, i.e., how many slots (=capacity) will be made available to the airlines and, by extension, to consumers. All subsequent steps of the process deal with demand-side questions (submission of slot requests by the airlines, allocation of slots to these requests, etc.). Thus, in a way, the declaration of capacity addresses "50% of the equation".

The setting of the declared capacity is a complex task that requires: careful analysis of uncertainty regarding operating conditions at the time when scheduled operations actually take place; computation of true operating capacity for each set of operating conditions; understanding of the tradeoffs among different performance objectives; and, eventually, reaching a consensus of the stakeholders on the appropriate best value of the coordination parameters.

Regulation 95/93 provides little guidance on how to set declared capacities and on the conditions under which airports should be designated as Level 3, in the first place. Actual practices, in this respect, vary widely within the EU and Europe (as

well as worldwide). This may be a contributing factor to the extensive use of the Level 3 designation in Europe. The approaches used in different Member States to determine the coordination parameters of Level 3 airports range from advanced and sophisticated to quite simplistic. In some instances, there may also be a bias toward declaring low capacities, possibly under the (questionable) objective of avoiding any scheduling that may lead to even small expected air traffic delays. A survey of the evolution of total declared hourly capacities of runway systems at a sample of 28 major Level 3 airports indicated that these capacities have increased little, on average, over the past 12-15 years, with the exception of the few airports where a new runway has been added during that time.

§3.63. Improving the processes for (i) designating airports as Level 3 and (ii) determining the values of declared capacities (coordination parameters) should be a high-priority item. Specific recommendations include:

- a) Perform a study aimed at understanding the factors that may be contributing to the slow pace at which new slots at EU Level 3 airports are created.
- b) Develop guidance on best practices for assessing whether capacity “falls significantly short” at busy airports and for determining the values of coordination parameters.
- c) Add specificity to Regulation 95/93 on the conditions under which an airport can be designated as Level 3 and on acceptable analyses and methods for determining the values of coordination parameters.

Chapter 4: Conclusions and Recommendations

1. General Context

Regulation 95/93 guides the slot allocation process at Level 3 airports in 32 European States – the EU Member States, the European Economic Area States and Switzerland. About 100 Level 3 airports currently operate in these States, close to 50% of the world’s total number of Level 3 airports. They served 76% of all airport passengers in the 32 States in 2018. They are therefore critical to the functioning of the entire air transport system in these States and play a central role in shaping public perceptions about its performance.

Regulation 95/93, as it stands today, is based on the principles and allocation rules set forth in IATA’s *Worldwide Slot Guidelines* (WSG), with only minor differences. The application of the Regulation in each season essentially follows the process and timeline described in the WSG. As the WSG is far more detailed on procedural matters and allocation rules than the Regulation, the WSG serves as the by-default reference for coordinators, with the exception of the few instances where there are differences with the Regulation. In turn, the WSG itself is based on a set of fundamental principles and rules that date back to well before the deregulation/liberalization of EU air transport in 1993. During the time since then, momentous changes have taken place in the EU, European and global air transport sectors. Moreover, the Level 3 airports in the 32 States where the Regulation currently applies have become an enormously diverse group, in terms of size, level of congestion, priorities and needs.

Regulation 95/93 was last amended in 2004. The Commission also issued a Communication in 2008 that clarified certain aspects of the Communication. The 2011 Proposal of the Commission has generated extensive comments from the Council, the EP and the air transport community, but has not been acted on to date.

Recommendation:

A careful review of the Regulation is called for that will re-consider the 2011 Proposal, as well as other possible amendments. The objectives should be to:

- (i) Update the Regulation, so it is better aligned with and more responsive to the realities of today's air transport environment.
- (ii) Expand the Regulation's scope and perspectives so it is better able to address the broader spectrum of issues that currently arise at different Level 3 airports.

2. Tactical and Technical Issues

2.1 Complexity of the Slot Allocation Process

The Slot Allocation Process (SAP) at Level 3 airports has become increasingly complex, technically and substantively, over the years. As in the past, the SAP must consider several types of requests for slots by the airlines and comply with a set of priorities assigned to these slots, as well as with a demanding set of schedule regularity constraints. But the strong overall growth in demand for air travel has also led to the following four developments that have greatly contributed to the SAP's complexity:

- (a) An ever-expanding list of coordination parameters.
- (b) Severe scarcity of slots at some of the most important Level 3 airports.
- (c) Growing diversity of Level 3 airports in terms of size, level of congestion and types of issues faced.
- (d) Need to consider a lengthening list of "additional criteria" for slot allocation.

As a result:

1. It has become extremely difficult to assess the quality of the outcomes of any particular slot allocation, especially at the busiest and most important airports.
2. The inability to truly assess performance raises concerns about the transparency and fairness of the process.

2.2 Unused Allocated Slots

A key issue concerning the slot allocation process is whether it makes efficient use of the capacity available at Level 3 airports. One important aspect of this issue is the extent to which slots that were allocated to airlines at the beginning of the process eventually go unused for any reason. A survey of 18 major airports over a total of 44 summer seasons between 2016 and 2019 suggested the following conjectures:

- (a) Roughly 1 out of 10 of the slots that are allocated to the airlines at the beginning of each Summer season (i.e., on SAL Deadline) are either returned or cancelled by the end of the season; most of these slots go unused (are “lost”) with the exception of a very few airports, such as Amsterdam Schiphol and London Heathrow, where waitlisted requests can largely replace returned and cancelled series and slots.
- (b) More than 80% of the returns and cancellations of allocated slots take place before HBD.

Recommendation:

1. The large number of unused allocated slots (possibly of the order of nearly one million per year in the 32 States under some assumptions) is a problem that deserves concerted mitigation efforts.
2. Efforts to reduce the number of unused allocated slots should focus primarily on measures directed to the pre-HBD part of the process

2.3 Reducing the Number of Unused Allocated Slots

There are no simple remedies for reducing the large number of unused allocated slots. A set of complementary measures should be considered carefully. If successful they may lead to partial “recovery” of these unused slots. Potential measures include:

(a) Closing the “double-dip loophole”

The “double-dip loophole”, introduced in the WSG in 2007, provides a way to bypass the “80% usage” threshold and claim historic precedence for series that, in truth, were used for as little as 64% of the time.

Recommendation:

The Regulation should be amended to make clear that the double-dip is an unacceptable practice. Any ambiguity about this can be removed through a simple amendment to Article 10(3).

(b) Modifying the 80% usage requirement

Proposals to increase the 80% usage requirement, e.g., to 85% or to 90%, have been made over the years. The 80% requirement contributes to the number of unused allocated slots in cases where an airline is “sitting” on a series in order to preserve

historic precedence. Limited data suggest that, in recent years, only a small fraction of slot series (probably less than 5%, on average) have utilization rates between 80% and 89%. This, however, may not be the case in years of “lean” demand.

Recommendation:

1. Raising the 80% threshold will probably have a marginal impact at the most congested airports, but may benefit less-congested ones.
2. Any increase in the 80% threshold would be ineffective, if it is not coupled with the elimination of the double-dip threshold.
3. The 80% threshold is used globally as it is the standard set by the WSG. Consideration must be given to international compatibility issues when it comes to raising that threshold.

(c) Changes to critical dates and deadlines in the slot allocation timeline

More time between SRD and HBD, as well as between HBD and Season Start would help reduce the number of unused allocated slots by making it easier for airlines to submit requests for replacing returned series and cancelled slots and for controllers to process such requests and negotiate further changes. The issue of modifying the critical dates is complicated by the fact that, at this time, the Regulation does not specify a timeline for the slot allocation process (other than setting January 31 and August 31 as the effective HBD dates for the Summer and Winter seasons respectively), but defers, by default, to the WSG to set the detailed timeline of the process.

Recommendation:

1. The recently (2019) agreed lengthening of the time interval between SRD and HBD should be continued indefinitely; careful consideration should also be given to a limited increase in the time interval between HBD and Season Start.
2. The Commission should consider whether Regulation 95/93 should continue to defer to the WSG for its calendar or should be amended to specify more milestones (in addition to the HBD).

(d) Series and slot reservation systems

Series and slot reservation systems could contribute to discouraging the submission of excess requests for slots and subsequent return of series and cancellation of slots.

Recommendation:

1. Consideration should be given to permitting the use of such reservation systems at Level 3 airports.
2. For the period before HBD, the main focus of reservation systems should be on series of slots; for the period after HBD on individual slots.
3. Such reservation systems should be revenue neutral for airlines (collectively), as well as for airport operators; they should also not require any advance payments by the airlines.

(e) Increasing the minimum required length of slot series

The Regulation currently defines a slot series as consisting of *at least five slots*. But some short series may make it impossible to schedule longer series because they may “block” slot availability during key times. Slot allocations at many Level 3 airports thus might benefit from increasing the minimum required length of a series.

Recommendation:

1. Article 2(13) of the 2011 Proposal (that sets the minimum required length of slot series to 15 and 10 slots for the Summer and Winter seasons, respectively) merits favorable consideration.
2. Any increase in the minimum required length of a series will have to address a number of significant practical issues (e.g., short series that already have historical precedence rights, compatibility with international practices) and will require some flexibility in the way it is applied.

(f) Hedging against uncertainty regarding slot use

“Slot overbooking” in the initial stage of the allocation process (SAL), if executed carefully, may increase the utilization of capacity at many Level 3 airports. A conservative approach would initially allocate slots to airlines in numbers that exceed the coordination parameters by a small percentage, in accordance to historical statistics for each airport.

Recommendation:

This approach would not be applied at such airports as AMS or LHR, where little available capacity goes unused. But it could be given consideration at the majority of Level 3 airports, where some “slack” between capacity and demand exists, at least in certain hours and days. A carefully and conservatively designed overbooking approach at the initial slot allocation step may help reduce the amount of unused capacity during the season.

2.4 Technical Support for Coordinators and for Evaluating Potential Changes to the Slot Allocation Process

Recent and ongoing academic research has led to the development of powerful mathematical optimization models that can provide valuable technical support for coordinators during the Initial Slot Allocation (SAL) step of the slot allocation process by computing SALs that are (i) fully compliant with all coordination parameters, with the priorities of different categories of series requests, and with the schedule regularity constraints, and (ii) can take several additional criteria into consideration. An important side-benefit is that these models can be valuable assets for policy-makers and regulators, as well, as they can help assess the impact of many proposed changes to the Regulation, including the impact of certain types of additional criteria when allocating airport slots.

Recommendation:

Key stakeholders should consider experimenting with such models for potential adoption in practice.

3. Policy Issues

3.1 New Entrants

Provisions for new entrants (NE) in Regulation 95/93 have been largely ineffective in enabling potential new competitors to challenge dominant incumbents for a significant share of traffic at individual airports, especially at the most congested ones. They have not created conditions under which NEs and small incumbents can obtain “blocks of slots” of sufficient number and “quality” to enable them to compete effectively. Requests for series submitted under an NE designation have also been limited in number and fragmented.

Recommendation:

Consideration should be given to modifying Regulation 95/93 in two parallel and complementary directions, each of which can also be pursued by itself:

1. Make the definition of “new entrant” less restrictive to allow carriers to obtain more slots under the NE designation. Specifically, consider the following possible actions:
 - 1.1. Adopt Article 2(2) of the 2011 Proposal as a replacement for the current definition in Article 2(b) of Regulation 95/93; consideration should also be given to further strengthening Article 2(2) of the 2011 Proposal (see §3.7).
 - 1.2. Amend Article 2(b)(i) of Regulation 95/93 [or Article 2(2)(a) of the 2011 Proposal] to increase significantly the limit of “fewer than 5 slots” that currently applies to all NEs that cannot benefit from Article 2(b)(ii) of Regulation 95/93 [or Article 2(2)(b) of the 2011 Proposal]; should such an amendment be adopted, it would require either a break with the WSG or an agreement on a global scale regarding this particular change.
 - 1.3. Amend Article 2(b) of Regulation 95/93 to remove the reference to a 4% slot limit for NEs at an “airport system”. [As an alternative, simply adopt Article 2(2) of the 2011 Proposal, which makes no mention of “airport system”.]
2. Assign higher priority to new entrant (NE) requests than to requests for changes to historic slots (CH) that are already held by incumbent carriers. If deemed beneficial, this amendment would be easy to implement through a simple change in the allocation procedure, as described in §3.14. This change may have important practical implications by giving NEs access to more desirable slots that are also assuredly available, thus stimulating currently lagging demand by new entrants.

3.2 Secondary Trading and Slot Property Rights

Secondary trading, as practiced today at some Level 3 airports in the UK, has important positive and negative impacts. Secondary trading (this is a partial list):

- (a) Is the only part of the current slot allocation process under Regulation 95/93 in which an economic instrument (i.e., monetary compensation) may play a role.
- (b) Makes explicit to incumbent carriers the *opportunity costs* associated with holding onto the slots in their current portfolios and may therefore stimulate slot mobility at the airports where it is allowed.
- (c) May serve to inform government policymakers, regulatory bodies and the public at large of the economic value of slots and of airport capacity.
- (d) Will tend to improve the alignment of the types of flights (as operated by the slot buyers) with the commercial opportunities and advantages offered by an airport.
- (e) May lead to reductions of air service to smaller and regional communities.
- (f) May be used by “rich” dominant carriers to consolidate or expand their position and market power at Level 3 airports.
- (g) Is often perceived as resulting in “windfall profits” for incumbent carriers.
- (h) May create disincentives for incumbent airlines when it comes to supporting investments aimed at increasing airport capacity, as more capacity leads to more competition and will reduce the scarcity of slots and dilute the value of slot portfolios.

Recommendation:

1. As far as Regulation 95/93 is concerned, the realistic options at this point are:
 - (i) Continue the existing hands-off policy that leaves it up to Member States to decide whether to permit secondary trading at Level 3 airports in their territory (to date only the UK does);
 - (ii) Amend Regulation 95/93 to permit secondary trading throughout the EU (and the 32 States), subject to certain conditions.

The choice between these two options is a “close call”, but it seems advisable in view of current circumstances (increasing scarcity of slots, an allocation process which is currently of an entirely administrative nature) to give full consideration to Option (ii), which introduces a much-needed economic instrument as a possible part of the process. Article 13 of the 2011 Proposal, in combination with related proposed amendments that have been introduced by the Council and the EP, could provide the basis for a regulatory framework whose spirit is consistent

with Option (ii). The EP and Council amendments would give Member States the right to impose temporary restrictions on secondary trading in their territory in cases where “*a significant and demonstrable*” problem may arise in connection with such trading.

2. Serious consideration should be given to (a) the possibility (also raised in an EP amendment to the 2011 Proposal) of allocating a portion of the revenue generated from the secondary trading of slots to a fund dedicated to increasing airport capacity through improvements in infrastructure and procedures and (b) tightening the regulation to also address issues related to slot leasing and temporary transfers.
3. Many of the issues raised by secondary trading are related to the question of slot ownership (who has property rights to slots and what do these rights entail). This is a complex legal question that has remained unresolved for a very long time. It is essential to finally address it in a definitive way, recognizing that the attendant process may prove time-consuming and contentious.

3.3 Super-Congested Airports

A small but extremely important group of Level 3 airports are operating at saturation or near-saturation levels, meaning that nearly all their slots are already occupied during most of the main operating hours of the busy days of the week. The conditions that prevail today at these “super-congested” airports were not anticipated by Regulation 95/93, as it stands today, and may call for a substantially different approach to slot allocation at these airports than the one now in force.

Should a new class of “Level 4” (“super-congested”) airports be established, it will be important to limit its membership to a small number of major airports that play a critical role in the European air transport system and have very limited or no slot availability during most of the useful hours of a day. For illustration purposes, a “partial” definition that focuses solely on the utilization of runway slots (see §3.33 for details) was applied to a limited number of major Level 3 airports. It was found that, among the airports tested, Amsterdam Schiphol (AMS), Dublin (DUB), Dusseldorf (DUS), Frankfurt (FRA), London Gatwick (LGW), London Heathrow (LHR), Lisbon (LIS), and Munich (MUC) would qualify for “Level 4” designation. It is also

conjectured that this set of airports would qualify under any reasonable alternative definition. A few other airports, for which data were not available, might also qualify, especially if the definition is extended, as it should, to include other elements of the airport (terminals, aprons) or capacity time scales other than hourly. Obviously, more airports may join this group in the future should current rates of traffic growth persist.

Recommendation:

To address the issues associated with Level 4 airports, Regulation 95/93 should be amended with provisions that:

1. Specify the conditions that airports must fulfill to qualify for Level 4 designation.
2. Describe steps that will be taken at Level 4 airports to (i) prevent stagnation in slot occupancy and preserve competition and (ii) maximize the economic and social benefits generated at these airports. The steps would consist of:
 - 2.1 Stronger tactical measures aimed at increasing slot mobility and discouraging practices that may contribute to any waste of capacity.
 - 2.2 Authorizing Member States, in consultation with air transport stakeholders, to specify airport-specific strategic criteria for slot allocation at their Level 4 airports. Coordinators would be required to treat these as their primary allocation criteria. If necessary, aggressive regulatory intervention to achieve objectives (i) and (ii) would be an option. Examples of such criteria and interventions are given in §3.40 and §3.41.

3.4 Allocation of Large Blocks of New Capacity

Regulation 95/93 does not draw a distinction between instances in which the declared capacity of a Level 3 airport is increased marginally and those in which a large block of slots is added all-at-once because of a major expansion of an airport's infrastructure, such as a new runway or terminal. However, these two situations actually differ greatly, with the latter offering the rare opportunity to plan strategically for the future of the subject airport, especially in cases where the airport previously operated at a level close to saturation.

Recommendation:

1. Consideration should be given to amending Regulation 95/93 to address cases in which a large number of new slots become available all-at-once at a Level 3 airport. The amendments should allow a Member State to invoke or establish airport-specific criteria for allocating the newly available block of slots with the objectives of: creating conditions for the long-term preservation of a competitive environment; improving domestic and/or international connectivity; and enabling sustainable growth of traffic.
2. Occasions of major capacity expansion may also be used to test innovative approaches to slot allocation. Examples of such criteria and approaches that span a range of possibilities are given in §3.46. The feasibility and effectiveness of some of these depend on the resolution of the question of slot ownership and associated rights.
3. Whenever a major increase in the declared capacity of a Level 3 airport is imminent, it should be mandatory to perform an objective, transparent and detailed study, using state-of-the-art methodologies, on whether the subject airport should retain its Level 3 designation following the expansion or should be re-designated as Level 2 or even Level 1.

3.5 Transparency

One of the most common and persistent criticisms of the slot allocation process at Level 3 airports is that it is not sufficiently transparent.

Recommendation:

Three different areas can be identified for substantial improvement:

1. The text of Regulation 95/93 should be reviewed in detail and any points deemed ambiguous or requiring further elaboration should be clarified, either in the text of the Regulation itself or through a Communication similar to the one issued in 2008.
2. Stakeholders (especially airlines and airports) should be able to obtain explanations for the rationale behind certain allocation decisions, especially in cases where “additional criteria” are applied to resolve instances in which two or more carriers are competing for the same slot. Coordinators should be given

adequate resources for the task of responding to inquiries of this type. Better lines of (occasionally proactive) communication with coordinators would also be helpful.

3. Dissemination of information about developments at Level 3 airports and easy access to related detailed data are very much in the public interest. To this effect, Article 6 of the 2011 Proposal should be adopted and should replace Article 4(8) of Regulation 95/93. The online posting by coordinators of annual reports on developments at the Level 3 airports for which they have responsibility should also be a requirement. The reports should contain the freely accessible information specified in Article 6 of the 2011 proposal. Adequate resources for this task should be made available to coordinators.

3.6 Declared Capacity

The first step in the Slot Allocation Process at any Level 3 airport is the setting of the airport's "declared capacity", or "coordination parameters". This is a critically important step, as it determines the "supply" side of the process – how many slots (i.e., how much capacity) will be made available to the airlines.

The setting of declared capacity is a complex task that requires: careful analysis of uncertainty regarding operating conditions at the time when scheduled operations actually take place; computation of true operating capacity for each set of operating conditions; understanding of the tradeoffs among different performance objectives; and, eventually, reaching a consensus of the stakeholders on the best values of the coordination parameters. Much progress has been made in recent years in developing advanced methodologies and computing tools for supporting this process.

Regulation 95/93 provides little guidance on how to set declared capacities and on the conditions under which airports should be designated as Level 3, in the first place. Actual practices, in this respect, vary widely within the 32 States (as well as worldwide). This may be a contributing factor to the extensive use of the Level 3 designation in Europe.

The approaches used in different Member States to determine the coordination parameters of Level 3 airports range from advanced and sophisticated

to quite simplistic. In some instances, there may also be a bias in favor of declaring low capacities, possibly motivated by the questionable objective of avoiding any scheduling that may lead to even small expected air traffic delays.

A survey of the evolution of declared hourly capacities of runway systems at a sample of 28 major Level 3 airports also indicated that these capacities have seen limited increases, on average, over the past 12-15 years, with the exception of the few airports where a new runway has been added during that time.

Recommendation:

Improving the processes for (i) designating airports as Level 3 and (ii) determining the values of declared capacities (coordination parameters) should be high-priority objectives. Specific recommendations include:

1. Perform a study aimed at understanding the factors that may be contributing to the slow pace at which new slots at EU Level 3 airports are created.
2. Develop guidance on best practices for assessing whether capacity “falls significantly short” at busy airports and for determining the values of coordination parameters.
3. Add specificity to Regulation 95/93 on the conditions under which an airport can be designated as Level 3 and on acceptable analyses and methods for determining the values of coordination parameters.

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