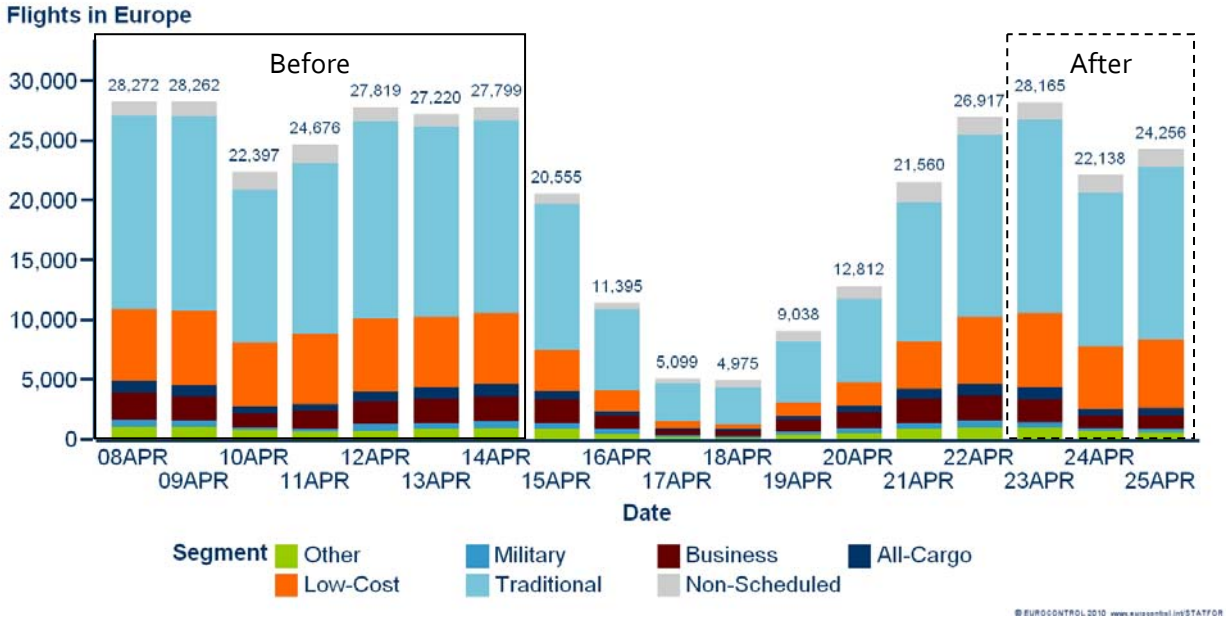
Ash-cloud of April and May 2010: Impact on Air Traffic

Figure 1. Traffic in Europe[1] before and during the April crisis.



Summary:

The airspace closures in Europe resulting from the eruption of the Eyjafjallajökull volcano from 14 April 2010 led to the disruption of some 100,000 flights and 10 million passenger journeys. The economic impact and the operational decisions have been addressed elsewhere. This report complements those studies. It considers the impact in terms of numbers of flights, with the principal aim of helping those who will analyse traffic statistics and their trends in the coming months and years.

This draft of the report includes additional material estimating the effects of the eruptions in May, which added a further 7,000 ash-cloud cancellations to the total.

The main period of the crisis was 15th-22nd April, though the effects started earlier and continued later, especially in Scandinavia and Iceland. 104,000 flights were cancelled during the 8-day crisis. That is 48% of expected traffic over 8 days, peaking at 80% on 18th April. That implies approximately 10 Million passengers unable to board their flight.

Amongst the flights which actually took place during the crisis were more than 5,000 additional flights put on by scheduled and charter carriers. These additional flights were for one or more of three reasons: to reposition aircraft; to reposition crews; and to accelerate the repatriation of stranded passengers. For simplicity, the estimates presented elsewhere in this report are not adjusted to remove the effects of these flights.

[1] In this note, 'Europe' refers to the EUROCONTROL Statistical Reference Area, see www.eurocontrol.int/statfor/faq for definition.

Aside from Iceland, three States saw a 90% reduction in traffic in April over 5 consecutive days: Finland, Ireland and the UK. Santa Maria (airspace of the Azores) was the only region with a net increase in flights. In May, Ireland was the most affected, but principally in a reduction of its overflights.

In April, Icelandic traffic was affected for 13 rather than the 8 days seen elsewhere. The impact over the whole month was not quite as high as worst-affected Finland, principally because Iceland was able to maintain some flights to North America. In May, Iceland lost some arrival and departure traffic, but the main effect was the re-routing of the North Atlantic flows to the North of the ash, which at the peak increased overflight traffic by a factor of 6.

Low-cost traffic was the hardest hit, losing 61% of flights over the 8-day crisis, compared to 48% for all traffic. Higher exposure and a less flexible business model likely causes of this. Business aviation was least affected, with traffic 34% down. A similar pattern was seen in May, but on a much smaller scale.

The most affected airports naturally correspond to the most affected States: Helsinki, Dublin, Manchester and Edinburgh all had less than 25% of the expected number of flights over the 8-day period. Dublin was also the most-affected in May.

Delays in April were up compared to April 2009 (which was a historic low), though better than recent months. Unsurprisingly, there was a large increase in delays attributed to 'other' (ie volcanic activity). However, May saw a much bigger impact in terms of delays, with 43% of flights delayed on departure, 10 percentage points higher than 2009.

Contents

1. INTRODUCTION

1.1 Background

On Wednesday 14 April 2010 and in the days which followed, an ash cloud spreading South and East from Eyjafjallajökull in Iceland triggered the progressive closure of much of European airspace by the respective national authorities. It was the role of EUROCONTROL to communicate these closure (and re-opening) decisions and to coordinate the flow of traffic.

Not until Friday 23 April 2010 did the number of flights get back to normal levels; and even this aggregate statistic concealed continuing local disruptions as well as a significant number of supplementary flights as airlines worked to repatriate stranded travellers and to restore their networks. The estimates described here indicate that some 100,000 flights were cancelled, which means that around 10 million passenger journeys were disrupted, not to mention the logistics networks that were frozen.

Subsequently, the ash cloud returned on and off between 4th and 17th May, leading to an estimated 7,000 further cancellations. In May the effects were felt much more strongly in terms of delays (and re-routing of North Atlantic flows) than in cancellations[2].

1.2 Aim of this report

An event such as this can be studied from a wide range of perspectives: economic, political, operational, meteorological, geological to name but a few. This report focuses on just one perspective: statistics and forecasts. In the coming months and years - when analysing traffic statistics and making forecasts - allowances will need to be made for the ash cloud impact. This report aims to *estimate* the impact and provide a reference to support this.

EUROCONTROL has also published a timeline[3] of the operational events (reproduced for the record in Annex A). Vice President Kallas of the European Commission has also reported on the impact and discussed political and regulatory responses[4]. The present report aims to complement such perspectives using more detailed statistics.

1.3 Method

The results presented here are *estimates* of the impact, based on EUROCONTROL's archives of flight plans for all IFR flights in Europe. 'Cancelled flights' are calculated by subtracting the actual number of flights on the day from the expected number of flights. The 'expected' number is estimated by averaging traffic on a day before and a day after the crisis. Annex B gives more detail of the method. Annex C shows how this method of calculating 'expected' flights is an improvement on the method used during the crisis, when only the traffic before the crisis was available to be used.

The archived flight details include aircraft type. Estimates of passenger trips disrupted are calculated from average seats per aircraft type and approximate load factors of 75% intra-Europe, 85% elsewhere.

[2] *First Look At Delays, May 2010*, CODA, June 2010, www.eurocontrol.int/coda.
[3] www.eurocontrol.int/corporate/public/standard_page/volcanic_ash_cloud_chronology.html
[4] *Conséquences du nuage de cendres généré par l'éruption volcanique survenue en Islande sur le traffic aérien – état de la situation*, Commission Européene, SEC(2010)533, OJ1915, 27 April 2010.

2. OVERVIEW: EXTENT OF THE CRISIS

The main period of the crisis was 15th-22nd April, though the effects started earlier and continued later, especially in Iceland. More-localised cancellations were also seen over 8 days in May.

2.1 Overview: April

Figure 1 provides an initial illustration of the scale of the impact. It shows day-by-day the number of flights in the ESRA08[5] region, by market segment, including the 7 days before for reference. The 18th April had fewer than 5,000 flights, compared to 24,700 the previous Sunday. Sundays usually have rather fewer flights than Mondays so, as we shall see, in terms of 'cancelled flights' it was probably on a par with 19th April.

Airspace closures began on 14 April and network disruption continued to the 25th and beyond (see section 2.2). Figure 2 shows the estimated rate of flight cancellations from 14th-25th April: the box covers the middle 50% of States; marked outliers are those well away from the other States[6]. Iceland is not included here, but discussed in section 6. The highest values on 14th April appear to be due to the estimation process, not linked to the cloud (they are geographically far away). The same is largely true on 24th and 25th April. On 23rd it was mostly Scandinavian countries seeing cancellations, but at much lower rates (5%-10%) than previous days. Therefore, for simplicity, the period selected for analysis is 15th to 22nd April.

Figure 2. Estimated cancellations in April (one observation per State per day)

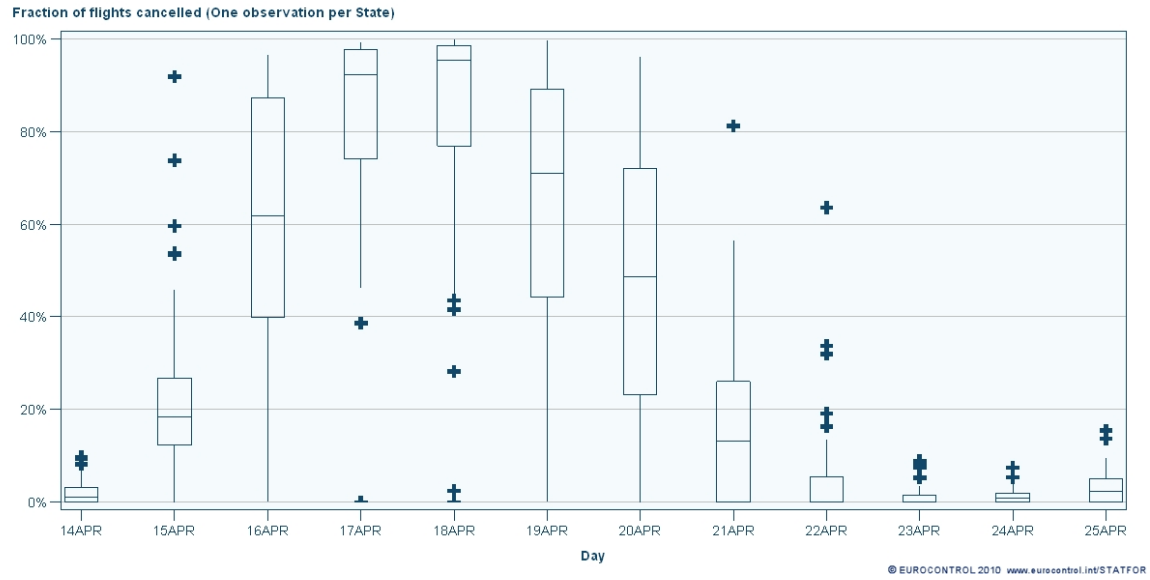
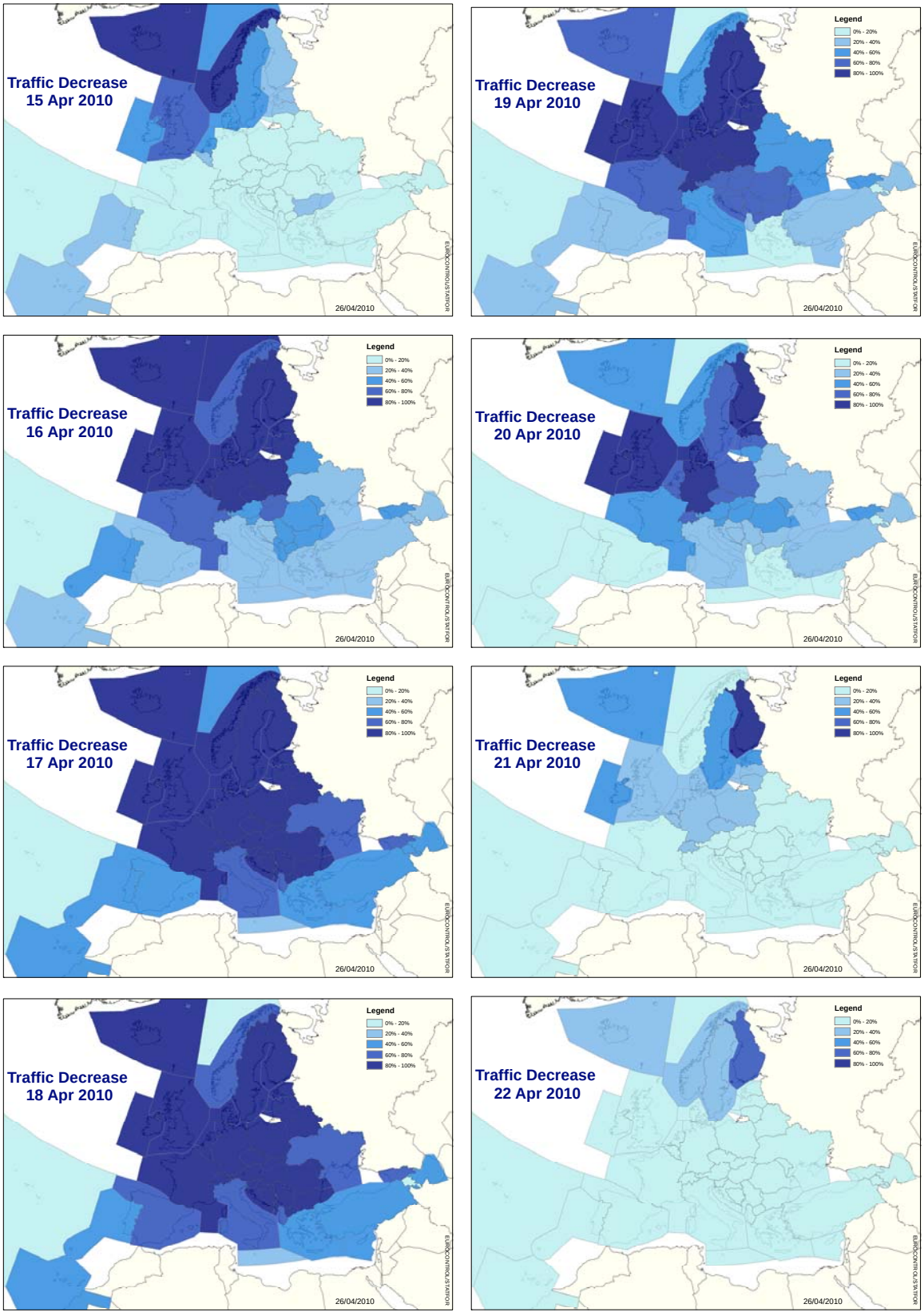


Figure 3 shows the geographical evolution for the main days of the crisis. Darker areas have a more complete closure (the darkest blue indicates 80%-100% fewer flights than the week before the crisis). The geographical extent of the closure expanded and contracted, but was at its largest around 17th-18th April : on 18th even continental Spain was seeing between 60% and 80% fewer flights.

Although by 22nd traffic was reported as being 'almost back to normal' (Annex A) this really referred to total traffic volumes. Figure 3 shows there were continuing cancellations in Northern Europe, though affecting a relatively small proportion of total traffic.

[5] See www.eurocontrol.int/statfor/faq for definition.
[6] The values for this box plot are listed later in Figure 8.

Figure 3. Effect (percentage difference from week before) by State or region.



2.2 Overview: May

The events of May 2010 are described in Annex A using the daily reports issued by EUROCONTROL at the time and summarised here. In addition to Iceland, Ireland and Scotland were repeatedly affected, as were the North Atlantic traffic flows. The biggest effects in terms of cancellations were on: Sunday 9th May, when the cloud arrived in the Alps; and 17th May when the South East of the UK and, for a time Schiphol, were affected. Although there is some evidence of cancellations on 7th and 12th May, the numbers are too small for our estimation method to be reliable, so they are excluded. In total then, 8 days are deemed to have been affected: 4, 5, 8, 9, 10, 11, 16 and 17 May. After the 17th May Eyjafjallajökull continued to produce ash for some days, but in smaller volumes and at lower altitude[7].

As experience grew of the effects of the ash, air transport had adapted to flying more whilst maintaining safety levels. This meant that, even if the scale of the cloud had been the same as in April, the number of cancellations would have been fewer.

The ash-cloud effects are confounded with a Greek general strike on 5th May which caused flights to be cancelled on the day itself, and also on the 4th. The tables in this report include both effects, but the headline figure of 7,000 flights *excludes* the strike.

3. ADDITIONAL FLIGHTS

Amongst the flights which actually took place during the crisis were more than 5,000 additional flights put on by scheduled and charter carriers. These additional flights were for one or more of three reasons: to reposition aircraft; to reposition crews; and to accelerate the repatriation of stranded passengers. For simplicity, the estimates presented elsewhere in this report are *not* adjusted to remove the effects of these flights.

The number of additional flights was obtained in two steps:

- Firstly by identifying scheduled & (non-business aviation) charter flights which took place between 19th and 25th April, but whose callsigns were not observed in the matching days before and after the crisis. That is, these flights were apparently only seen during the crisis.
- Often such flights had an extra letter 'P' or 'F' in the callsign, indicating positioning or ferry. In other cases, airlines used ranges of numbers 'AAA9xxx' which are not in their usual set of callsigns. The list from the first step was inspected to validate the initial selection. Some flights which appeared to be one-off charters in a region unlikely to have been affected (eg Turkey-Middle East) were eliminated from the list.

The results are shown in Figure 4. Over the seven days examined more than 5,200 additional flights were identified. It is likely that there were further additional flights in subsequent days, though the effort in identifying them begins to outweigh the benefits from the quantification.

In theory, the estimate of 'cancelled' flights (discussed in section 2) should be increased by the number of additional flights, because the estimate of 'expected' flights (based on neighbouring weeks) does not include such additional flights:

Cancelled Flights = (Expected Flights + Additional Flights) – (Actual flights).

This pushes the 11-day total for Europe to nearly 110,000 movements. However, for simplicity, the estimates presented elsewhere in the report are not adjusted to account for these additional flights, so the 'cancellation' estimates presented elsewhere will tend to err on the low side as a result.

[7] An excellent source is the reports of the Iceland Met Office: http://en.vedur.is/earthquakes-and-volcanism/articles/nr/1884 accessed 24/6/10.

Figure 4. Estimates of additional flights.

	Number of additional flights
19APR	645
20APR	920
21APR	1193
22APR	793
23APR	495
24APR	540
25APR	699
TOTAL	5285

Since the effects were much smaller in May, the same exercise has not been repeated for the May ash-cloud.

4. OVERVIEW OF IMPACT IN EUROPE

104,000 flights were cancelled during the April crisis. That is 48% of expected traffic over 8 days, peaking at 80% on 18th April. That implies approximately 10 Million passengers unable to board their flight. A further 7,000 flights were cancelled due to ash in May.

Figure 5 presents the details of the flights during the crisis in April and the estimated impact. Statistics for Europe as 'EU27', rather than 'ESRA08', are given in Annex D. In total over the period there were 112,400 flights, and an estimated 104,000 cancelled flights, so 48% of flights were cancelled over the 8 day period. The most severely-affected day was 18 April, when traffic was 80% below expected volumes across Europe.

104,000 flights would have been expected to carry around 10 Million passengers. The number of people affected will be lower than this, of course, as many people will have had both outbound and return leg disrupted. The number of passenger journeys disrupted drops off more quickly than cancelled flights, because the long-haul traffic recovered more quickly and tends to use larger aircraft.

Some flows began to recover relatively soon, indicated by the negative values for North Africa from 20 April, for example. By 22nd April the cancellations were largely confined to short-haul ('within Europe') flights.

Figure 5. Estimate of impact in Europe in April (ESRA08)[8].

		15APR	16APR	17APR	18APR	19APR	20APR	21APR	22APR	TOTAL
1. Within Europe	Actual Flights	16,016	8,979	3,341	3,031	6,503	9,178	16,653	21,320	85,021
	Estimated Cancelled Flights	7,376	14,339	13,602	15,648	16,363	13,357	6,520	2,072	89,276
	Estimated Passengers Unable To Board (Thousands)	568	1,162	1,210	1,353	1,296	1,024	517	98	7,229
2. To/From Russia, Asia	Actual Flights	1,317	708	324	450	677	956	1,469	1,639	7,540
	Estimated Cancelled Flights	352	1,082	1,169	1,174	922	596	185	30	5,510
	Estimated Passengers Unable To Board (Thousands)	47	166	200	208	157	101	40	-8	910
3. To/From North Africa	Actual Flights	924	502	464	475	706	975	1,069	1,207	6,322
	Estimated Cancelled Flights	76	425	807	935	199	-125	-318	-207	1,793
	Estimated Passengers Unable To Board (Thousands)	11	57	108	126	32	-16	-43	-30	246
4. North Atlantic	Actual Flights	788	284	193	156	233	499	750	998	3,901
	Estimated Cancelled Flights	190	712	772	822	755	438	202	-20	3,872
	Estimated Passengers Unable To Board (Thousands)	35	156	177	183	168	105	52	-1	876
5. To/From Middle East	Actual Flights	776	399	254	337	388	516	811	909	4,390
	Estimated Cancelled Flights	106	362	509	588	398	279	-7	-27	2,208
	Estimated Passengers Unable To Board (Thousands)	23	76	103	116	86	55	3	-8	454
6. Mid/South Atlantic	Actual Flights	242	143	133	131	141	204	251	270	1,515
	Estimated Cancelled Flights	1	105	157	173	130	46	-11	-27	575
	Estimated Passengers Unable To Board (Thousands)	2	27	38	42	33	11	-2	-5	146
7. To/From Southern Africa	Actual Flights	184	94	84	59	79	148	229	228	1,105
	Estimated Cancelled Flights	27	147	154	194	154	55	-7	-17	706
	Estimated Passengers Unable To Board (Thousands)	9	36	37	43	36	15	1	-3	174
8. Overflying Europe	Actual Flights	308	286	306	336	311	336	328	346	2,557
	Estimated Cancelled Flights	22	36	42	28	-6	-6	3	-16	103
	Estimated Passengers Unable To Board (Thousands)	1	4	6	5	-2	-2	-3	-5	5
TOTAL	Actual Flights (Thousands)	20.6	11.4	5.1	5.0	9.0	12.8	21.6	26.9	112.4
	Estimated Cancelled Flights (Thousands)	8.2	17.2	17.2	19.6	18.9	14.6	6.6	1.8	104.0
	Estimated Passengers Unable To Board (Millions)	0.7	1.7	1.9	2.1	1.8	1.3	0.6	0.0	10.0

In May, the effects were more limited, geographically and in total number of cancellations. Figure 6 gives the totals, per day, showing how most of the 8,000 cancellations were on the 5th, 9th and 17th of May. However, these include up to 1,000 cancellations[9] due to the Greek general strike on 5th May. The ash-cloud effect is therefore estimated to be around 7,000 flights.

Figure 6. Estimate of impact of ash and general strike in Europe in May (ESRA08).

		04MAY	05MAY	08MAY	09MAY	10MAY	11MAY	16MAY	17MAY	TOTAL
TOTAL	Actual Flights (Thousands)	28.0	27.5	22.1	23.2	28.8	27.5	24.8	26.8	208.6
	Estimated Cancelled Flights (Thousands)	0.2	1.5	0.9	2.3	0.1	0.7	0.6	2.1	8.4
	Estimated Passengers Unable To Travel (Millions)	-0.0	0.1	0.1	0.2	0.0	0.1	0.1	0.2	0.8

[8] Negative values are reported if the estimation method produces them; they mean that more flights took place (or larger aircraft were in use) than in the reference days before and after the crisis.

[9] Estimated directly from Greek daily traffic figures, compare d to the same day in the following week.

5. STATES AND REGIONS

Aside from Iceland, three States saw a 90% reduction in traffic over 5 consecutive days in April: Finland, Ireland and the UK. Santa Maria (airspace of the Azores) was the only region with a net increase in flights. In May, Ireland was the most affected, but principally in a reduction of its overflights.

Figure 8 lists the estimated percentage of flights cancelled per State and per day. This table complements the maps shown in Figure 3, though it uses a more precise estimation method than the maps so there may be small differences. Details of flights per State are provided in annex E (including overflights) and G.

Santa Maria FIR, the airspace of the Azores, was the least affected. Indeed, over the duration of the crisis it saw an increase in flights as traffic re-routed to avoid blocked northerly airspace. Of the States whose traffic growth is reported in the STATFOR statistics dashboard (SID[10]), Santa Maria was the only one to see stronger growth in April than in March.

All other States saw at least a 15% decline in traffic over the period. Not unexpectedly, it was those in South East Europe which fared better, with Malta on 16% and Greece on 19%.

Apart from Iceland (reported separately in the next section), most strongly affected was Finland which lost 81% of flights over the period, because the closures continued there into 22nd April. Ireland and the UK, like Finland, saw a 90% reduction in flights or more for 5 consecutive days, but they recovered more quickly on the 21st April, so the overall percentage is lower. They both saw a 74% reduction in flights.

The results for May are given for those States or regions affected by more than 10% overall in Figure 7 and for all States in Annex E. Since the ash-cloud lingered for much of the time off Europe's Atlantic coast, it is not surprising that Ireland, the UK and the two parts of Portuguese airspace were the most affected.

These 'cancellations' include flights which re-routed to avoid the ash-cloud and in so doing did not fly through a particular block of airspace. Ireland is a prime example of this: missing some 5,000 flights over the period, but only 1,300 flights at its airports – so the majority of the reduction was in overflights.

Figure 7. Cancellation during May for the most-affected regions (full table in annex E).

Estimated Fraction Cancelled	04MAY	05MAY	08MAY	09MAY	10MAY	11MAY	16MAY	17MAY	All
Ireland	24%	27%	61%	54%	52%	56%	20%	31%	41%
Lisbon FIR			9%	11%	39%	38%	1%	2%	12%
Santa Maria FIR				14%	39%	58%			14%
UK	3%	15%	13%	8%	2%	1%	19%	26%	11%

[10] www.eurocontrol.int/statfor/sid

Figure 8. Summary of estimated cancellations per State[11] and per day in April. (Values over 90% are highlighted. Iceland is described separately in the following section)

Estimated Fraction Cancelled	15APR	16APR	17APR	18APR	19APR	20APR	21APR	22APR	All
Albania	17%	43%	68%	77%	31%	14%	0%	0%	34%
Austria	15%	61%	98%	99%	76%	53%	21%	0%	52%
Belarus	0%	63%	86%	83%	61%	23%	14%	0%	42%
Belgium/Luxembourg	39%	96%	98%	98%	97%	72%	25%	0%	65%
Bosnia-Herzegovina	18%	33%	91%	97%	67%	31%	0%	0%	43%
Bulgaria	21%	61%	88%	96%	68%	38%	0%	0%	47%
Canary Islands	25%	34%	55%	45%	23%	1%	0%	0%	25%
Croatia	20%	40%	92%	95%	68%	39%	0%	0%	45%
Cyprus	9%	29%	46%	44%	28%	11%	0%	0%	21%
Czech Republic	12%	87%	98%	98%	89%	66%	28%	6%	60%
Denmark	60%	87%	99%	99%	97%	91%	40%	16%	72%
Estonia	24%	95%	97%	99%	96%	83%	46%	19%	68%
FYROM	16%	49%	86%	91%	69%	30%	6%	0%	45%
Finland	39%	90%	98%	100%	93%	96%	82%	64%	81%
France	20%	67%	87%	92%	77%	54%	16%	0%	51%
Germany	20%	84%	98%	99%	96%	81%	40%	2%	64%
Greece	11%	32%	47%	42%	12%	0%	0%	0%	19%
Hungary	15%	66%	98%	98%	79%	54%	16%	3%	53%
Ireland	54%	94%	98%	100%	100%	90%	48%	8%	74%
Italy	9%	30%	74%	77%	59%	26%	6%	0%	35%
Latvia	23%	95%	97%	98%	93%	75%	36%	7%	65%
Lisbon FIR	25%	40%	56%	46%	32%	0%	0%	0%	26%
Lithuania	8%	87%	90%	91%	81%	61%	25%	0%	55%
Malta	11%	32%	39%	28%	13%	0%	0%	0%	16%
Moldova	17%	50%	95%	92%	80%	43%	17%	14%	51%
Netherlands	53%	96%	98%	99%	98%	75%	33%	1%	68%
Norway	92%	73%	92%	77%	44%	50%	15%	34%	57%
Poland	10%	88%	97%	95%	89%	76%	31%	2%	60%
Romania	12%	52%	94%	97%	81%	42%	12%	1%	48%
Santa Maria FIR	0%	0%	0%	0%	0%	0%	0%	0%	0%
Serbia&Montenegro	18%	48%	92%	97%	68%	39%	0%	0%	47%
Slovakia	17%	77%	98%	97%	78%	48%	13%	0%	53%
Slovenia	20%	55%	97%	99%	70%	51%	9%	0%	50%
Spain	18%	39%	59%	66%	37%	16%	0%	0%	30%
Sweden	54%	84%	99%	99%	83%	80%	57%	32%	71%
Switzerland	13%	64%	98%	98%	94%	61%	23%	2%	56%
Turkey	13%	39%	51%	50%	31%	23%	0%	0%	26%
Ukraine	7%	38%	80%	81%	48%	25%	13%	4%	38%
UK	74%	95%	99%	99%	99%	93%	38%	6%	74%
EU27	27%	62%	80%	83%	72%	56%	25%	5%	50%
ESRA08	28%	60%	77%	80%	68%	53%	23%	6%	48%

[11] For statistical purposes, 'State' is defined using airspace structure. As a result, Belgium & Luxembourg and Serbia & Montenegro are merged, Spain and Portugal are each split into two.

6. ICELAND

In April, Icelandic traffic was affected for 13 rather than the 8 days seen elsewhere. The impact over the whole month was not quite as high as worst-affected Finland, principally because Iceland was able to maintain some flights to North America. In May, Iceland lost some arrival& departure traffic, but the main effect was the re-routing of the North Atlantic flows to the North of the ash, which at the peak increased overflight traffic by a factor of 6.

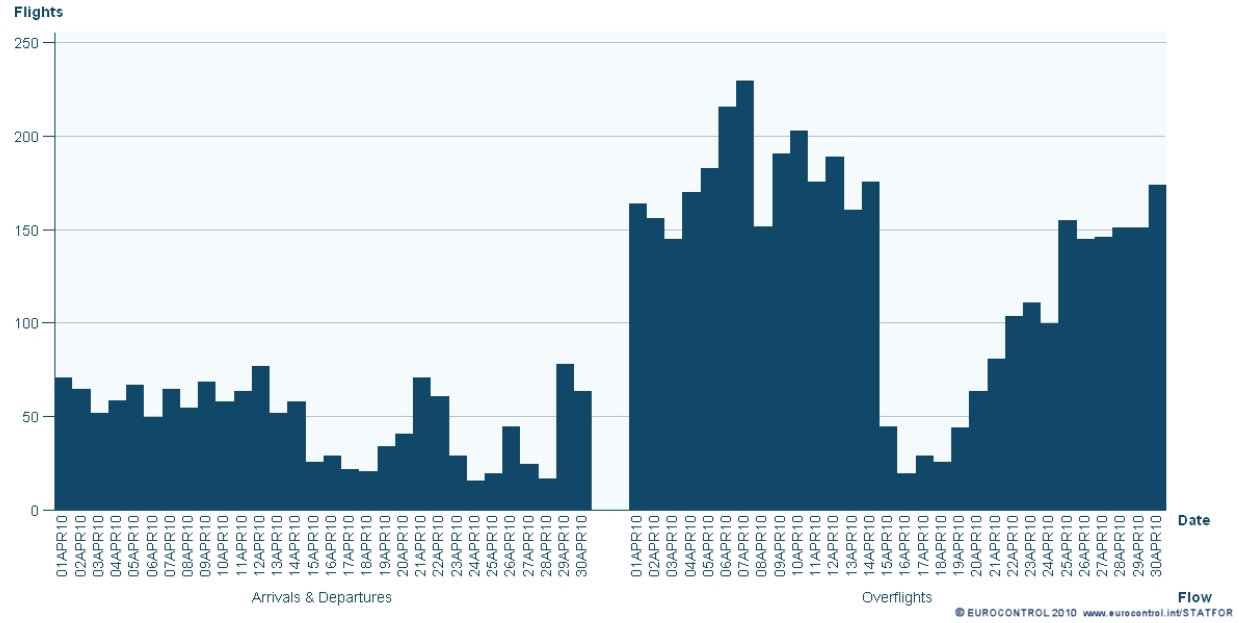
EUROCONTROL/STATFOR organises the data provided by Iceland for statistical purposes in a way that allows monthly rather than the daily analysis that has been presented so far. Furthermore, the impact on Icelandic air traffic has been more persistent than elsewhere in Europe. So the effects on Iceland are summarised separately in this section using a simplified analysis based directly on traffic counts per day rather than the more detailed routines used elsewhere.

Figure 9 shows the number of flights per day in April, split into international arrivals and departures and overflights. We have no statistics on any internal (domestic) Icelandic flights. Note that the larger flow, overflights, does not particularly follow a weekly cycle, being instead determined by the weather patterns which determine where the Westbound North Atlantic tracks are placed.

For estimation purposes, a reference of 50 arrival/departures and 150 overflights was taken. There were 12 days when the number of arrival/departures was below 50. As the figure shows, these fell in two separate periods: 15th-20th and 23rd -28th April. There were only 325 flights on these days instead of the nominal 12*50, so that is a 45% 'cancellation' rate, or approximately 275 'cancelled' flights. It is clear that at that time, the direction of the wind meant that the effect did not reach the 99% closure seen elsewhere. Similarly, there were 12 days when the number of overflights was lower than the 150 threshold, indicating 885 'missing' flights, again a 49% cancellation rate.

Looking at traffic for the whole month, there were 5,519 actual flights and an estimated 1,160 'cancelled' flights, so Iceland had something like 17% fewer flights over the entire month. The equivalent calculation for worst-affect Finland (section 5) is 23%. So, in April at least, Icelandic traffic was not the worst-affected of the European States, principally because it was able to maintain some flights to North America.

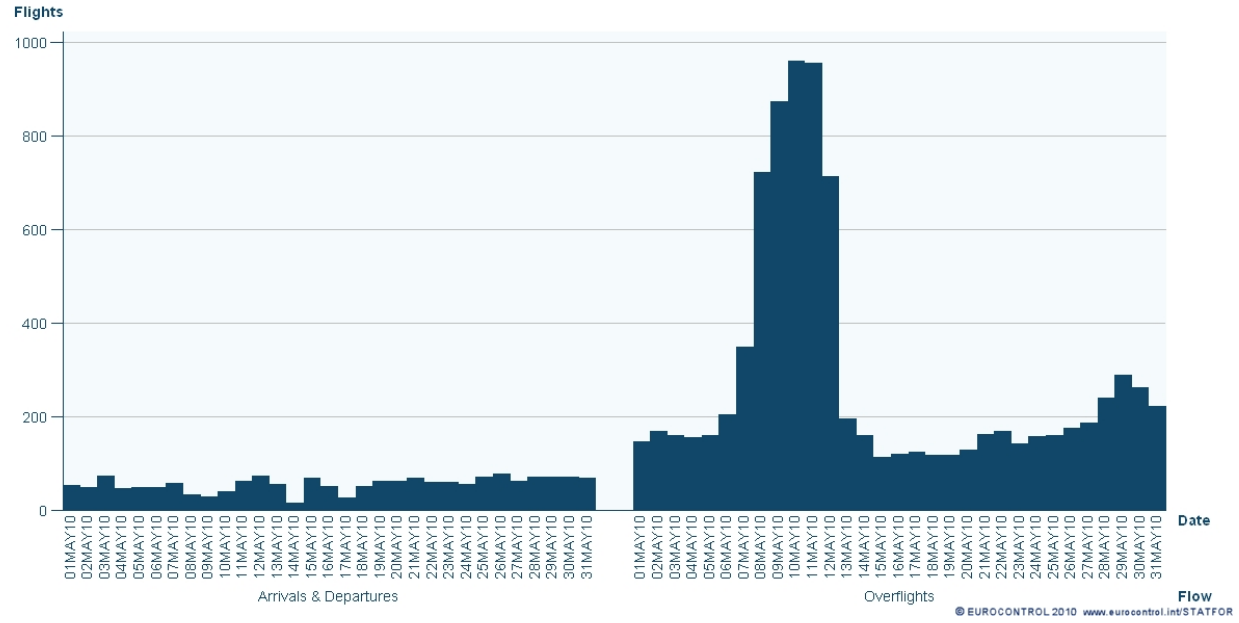
Figure 9. Icelandic flights in April



In May, the main effect for Iceland was that for several days a much larger portion of the daily North Atlantic flow was routed through Icelandic airspace, to pass to the North of the ash-cloud – peaking at 6 times the usual daily traffic. Over the whole period from 4 May to 22 May (allowing a margin after the end of large-scale eruptions), Iceland lost approximately 250 international arrivals and departures, or

13% . On the other hand, it *gained* some 3,500 flights due to re-routing, something like a 60% increase in traffic over the period.

Figure 10. Icelandic flights in May.



7. AIRPORTS

The airports most affected in April naturally correspond to the most affected States: Helsinki, Dublin, Manchester and Edinburgh all had less than 25% of the expected number of flights over the 8-day period. Dublin was also the most-affected in May.

The pattern of closures for airports in April is shown in Figure 11. Not surprisingly, this mirrors that of the States (section 5) fairly closely, though it highlights the early closures on the 15 April, in Manchester, Bergen and Edinburgh. In fact, Manchester was effectively closed (only 10% of normal flights) for six days, as long as any of the top 40 airports (ranked on traffic on 14 April). Helsinki-Vantaa lost 82% of its flights over the 8 days, Dublin 77%, Manchester and Edinburgh 75%.

A number of airports saw significantly more flights than usual on the 22nd April, indicated by negative values for Paris Ch De Gaulle and particularly for Brussels National with 37% extra. These numbers are more susceptible to the noise of local holidays and events than are the national figures, but certainly there were a significant number of extra flights on that day.

For May, because the size of the effect is smaller, the estimation process is not as robust and less detail is reported. Annex E provides estimates equivalent to Figure 11 for the 19 airports out of the busiest 40 in Europe which were most affected in May. For much of the time it was airports in Ireland, the North and West of the UK and the Iberian peninsular which were affected. The 9th May was unusual and a different group of airports – around the Alps mostly – were affected. Over the 8 days in May, Dublin again saw the largest reduction in flights, some 20% on average.

Figure 11. Cancellation rate at top 40 airports in April. (Days over 90% highlighted)

Rank on 14April		15APR	16APR	17APR	18APR	19APR	20APR	21APR	22APR	All
1	PARIS CH DE GAULLE	11%	95%	99%	99%	97%	63%	13%	-14%	59%
2	FRANKFURT MAIN	6%	95%	99%	99%	96%	85%	52%	-8%	65%
3	MADRID BARAJAS	4%	17%	26%	43%	25%	3%	-3%	-3%	14%
4	LONDON/HEATHROW	71%	97%	99%	99%	99%	97%	28%	-10%	72%
5	MUENCHEN 2	-4%	56%	98%	99%	95%	87%	47%	-12%	58%
6	SCHIPHOL AMSTERDAM	48%	98%	99%	100%	97%	62%	28%	-12%	64%
7	ROME FIUMICINO	-12%	15%	43%	35%	30%	-3%	-2%	-6%	13%
8	WIEN SCHWECHAT	5%	57%	98%	99%	42%	20%	7%	2%	38%
9	OSLO/GARDERMOEN	89%	77%	99%	97%	47%	52%	25%	27%	60%
10	COPENHAGEN KASTRUP	47%	82%	99%	100%	100%	97%	29%	13%	68%
11	ZURICH	1%	52%	98%	99%	98%	59%	15%	-2%	51%
12	DUESSELDORF	-13%	97%	99%	99%	95%	80%	56%	-7%	63%
13	ISTANBUL-ATATURK	-2%	21%	22%	26%	10%	10%	-2%	-1%	11%
14	BARCELONA	4%	18%	26%	70%	7%	3%	-9%	3%	14%
15	STOCKHOLM-ARLANDA	50%	77%	100%	99%	74%	70%	59%	28%	66%
16	ATHINAI E. VENIZELOS	10%	20%	21%	21%	14%	5%	-6%	-8%	10%
17	BRUSSELS NATIONAL	45%	97%	98%	98%	96%	51%	3%	-37%	56%
18	PARIS ORLY	0%	90%	91%	94%	89%	54%	3%	-5%	53%
19	MILANO MALPENSA	7%	30%	95%	97%	95%	64%	16%	-1%	51%
20	TEGEL-BERLIN	-23%	96%	100%	99%	95%	71%	51%	16%	61%
21	HELSINKI-VANTAA	24%	89%	99%	99%	98%	98%	91%	72%	82%
22	GENEVE COINTRIN	-2%	49%	98%	97%	95%	59%	22%	-0%	53%
23	LONDON/GATWICK	79%	99%	100%	99%	99%	95%	-6%	-26%	69%
24	HAMBURG	-5%	98%	100%	99%	94%	77%	44%	-19%	59%
25	KOELN-BONN	-8%	95%	98%	99%	95%	70%	35%	-5%	53%
26	MILANO LINATE	-18%	3%	89%	97%	89%	-1%	16%	12%	31%
27	PALMA DE MALLORCA	8%	41%	48%	69%	-4%	-30%	-22%	-6%	16%
28	STUTTGART	-32%	74%	99%	99%	96%	82%	34%	-13%	52%
29	WARSZAWA/OKECIE	2%	92%	98%	99%	95%	94%	20%	-12%	59%
30	PRAHA RUZYNE	-4%	76%	97%	98%	78%	48%	20%	0%	50%
31	DUBLIN	76%	87%	97%	100%	99%	97%	63%	6%	77%
32	LISBOA	5%	13%	43%	41%	22%	10%	-27%	-12%	12%
33	MANCHESTER	94%	97%	97%	99%	100%	96%	10%	-1%	75%
34	NICE	-3%	48%	70%	86%	35%	25%	12%	-6%	35%
35	BERGEN/FLESLAND	97%	71%	99%	82%	31%	80%	11%	81%	66%
36	LAS PALMAS	4%	2%	37%	21%	-9%	-14%	-29%	-11%	1%
37	LONDON/CITY	70%	99%	96%	100%	100%	100%	56%	-5%	72%
38	FERIHEGY-BUDAPEST	-0%	63%	96%	95%	77%	57%	33%	-3%	50%
39	MARSEILLE PROVENCE	4%	29%	46%	76%	-4%	8%	-1%	8%	20%
40	EDINBURGH	95%	97%	95%	100%	100%	82%	26%	15%	75%

8. MARKET SEGMENTS

Low-cost traffic was the hardest hit in April, losing 61% of flights over the 8-day crisis, compared to 48% for all traffic. Higher exposure and a less flexible business model likely causes of this. Business aviation was least affected, with traffic 34% down. A similar pattern was seen in May, but on a much smaller scale.

EUROCONTROL/STATFOR produces statistics in terms of a number of key market segments, such as all-cargo flights, non-scheduled ('charter') etc, for which the definitions are available in the SID[12]. This section compares the differing impact of the crisis on these market segments. Figure 12 gives the numbers of actual flights and estimated cancelled flights during the crisis for the ESRA08 region. Figure 13 gives the same in percentage terms, for both the ESRA08 and the EU27. These statistics include overflights (though for these regions overflights are a relatively small portion). For total percentages across all segments see Figure 8.

The worst-affected segment was the low-cost carriers, for whom the number of flights was down 61% over the 8 days. Indeed low-cost traffic was down 40% even on the 15th, when the average was 28% (Figure 8). Moreover, for this segment, cancellations continued further, into the 21st, when the number of flights was down by 35%, compared to an average of 23%. There are probably three linked factors contributing to this:

- Geographical exposure, since there are many low-cost flights in Ireland and the UK where the delays continued (section 0). For example, when matched on geographical exposure, low-cost is closer to other scheduled traffic: in the UK on 21st low-cost flights were down 44% and traditional scheduled 50%.
- Traffic which is predominantly short-haul, which recovered less quickly than the long-haul (Figure 5).
- A business model which is perhaps better suited to an all-or-nothing approach to operations in extreme circumstances such as these.

In respect of the last of these, the opposite end of the scale is business aviation, in which each flight is tailored to the needs of a small number of customers. Their business models were well-suited to rapidly adapting and changing to make the best of the available open airspace. As a result, business aviation suffered the least reduction in flights, only 34% over the 8-day period.

It is noticeable that 'charter' carriers (non-scheduled) were not far behind business aviation, losing 36% of flights in the ESRA08, though the business model is rather different. Indeed, charter apparently recovered by 21st. It is probable, that an important factor here was the significant number of additional flights (section 2.2) including some by 'scheduled' carriers which filed some of their additional flights as 'non-scheduled' , though this hypothesis would need further investigation in the data.

[12] www.eurocontrol.int/statfor/sid

Figure 12. Flights & cancellations for ESRA08 by market segment (thousands)

Including Overflights (Thousands of Flights)		15APR	16APR	17APR	18APR	19APR	20APR	21APR	22APR	TOTAL
Business Aviation	Actual Flights	1.9	1.2	0.5	0.5	1.0	1.4	2.0	2.1	10.5
	Estimated Cancelled Flights	0.4	1.0	0.7	0.9	1.0	0.7	0.2	0.3	5.1
All-Cargo	Actual Flights	0.7	0.3	0.1	0.1	0.3	0.5	0.9	1.0	4.0
	Estimated Cancelled Flights	0.3	0.6	0.4	0.4	0.5	0.4	0.1	0.0	2.9
Low-Cost Scheduled	Actual Flights	3.5	1.7	0.6	0.4	1.1	2.0	3.9	5.6	18.7
	Estimated Cancelled Flights	2.6	4.7	4.8	5.5	5.0	3.9	2.0	0.5	28.9
Traditional Scheduled	Actual Flights	12.1	6.8	3.2	3.1	5.1	7.0	11.7	15.2	64.2
	Estimated Cancelled Flights	4.1	9.4	9.6	11.2	11.4	9.0	4.5	1.1	60.4
Non-Scheduled	Actual Flights	0.9	0.5	0.4	0.6	0.9	1.1	1.7	1.5	7.6
	Estimated Cancelled Flights	0.5	0.9	1.1	0.9	0.3	0.0	-0.5	-0.2	3.0
All[13]	Actual Flights	20.6	11.4	5.1	5.0	9.0	12.8	21.6	26.9	112.4
	Estimated Cancelled Flights	8.2	17.2	17.2	19.6	18.9	14.6	6.6	1.8	104.0

Figure 13 also shows the percentage of 'cancellations' during the May ash-cloud. Approximately the same pattern was seen, but on a much smaller scale: most cancellations for low-cost; then traditional scheduled and all-cargo carriers; and fewest for business aviation and non-scheduled (leisure 'charter').

Figure 13. Percentage cancellations for EU27 and ESRA08 for the main market segments

EU27

Including Overflights (% 'cancelled' flights)	15APR	16APR	17APR	18APR	19APR	20APR	21APR	22APR	TOTAL
Business Aviation	15%	44%	57%	67%	52%	36%	10%	10%	33%
All-Cargo	29%	64%	78%	82%	67%	49%	15%	3%	43%
Low-Cost Scheduled	42%	74%	91%	95%	84%	67%	35%	7%	62%
Traditional Scheduled	23%	61%	78%	82%	74%	60%	30%	6%	51%
Non-Scheduled	28%	62%	75%	72%	37%	11%	0%	5%	40%

ESRA08

Including Overflights (% 'cancelled' flights)	15APR	16APR	17APR	18APR	19APR	20APR	21APR	22APR	TOTAL
Business Aviation	18%	44%	57%	65%	51%	38%	14%	13%	34%
All-Cargo	31%	63%	78%	82%	63%	46%	15%	4%	42%
Low-Cost Scheduled	43%	73%	89%	93%	82%	66%	35%	9%	61%
Traditional Scheduled	25%	58%	75%	78%	69%	56%	28%	7%	49%
Non-Scheduled	34%	63%	73%	62%	27%	13%	0%	1%	36%

TZ ESRA08

% 'cancelled' flights	04MAY	05MAY	08MAY	09MAY	10MAY	11MAY	16MAY	17MAY	TOTAL
Business Aviation	0%	1%	2%	12%	0%	1%	1%	0%	2%
All-Cargo	1%	8%	3%	11%	2%	3%	3%	9%	5%
Low-Cost Scheduled	0%	7%	9%	15%	1%	1%	11%	8%	6%
Traditional Scheduled	0%	4%	0%	7%	0%	1%	0%	8%	3%
Non-Scheduled	0%	7%	1%	0%	0%	0%	1%	2%	1%

[13] 'All' here includes the 'military' and 'other' segments which are not shown separately in the table.

9. DELAYS

Delays in April were up compared to April 2009 (which was a historic low), though better than recent months. Unsurprisingly, there was a large increase in delays attributed to 'other' (ie volcanic activity). However, May saw a much bigger impact in terms of delays, with 43% of flights delayed on departure, 10 percentage points higher than 2009.

For operations staff, there are more details of air traffic flow and capacity management (ATFCM) delays in the EUROCONTROL/CFMU monthly network operations report. That report for April also contains maps showing the extent of closure of operational airspace. The CODA Digest for April[14] summarises the delays experience by airlines from all causes – and details how delays increased moderately.

Preliminary data on all-causes delay for May shows that the ash-cloud had a much more significant effect[15] in May than in April. The proportion of *en route* delay as a share of the whole more than doubled, jumping to 20% from 8.4% a year earlier. Around 43% of flights were delayed by more than 5 minutes on departure, up 10 percentage points on May 2009 and 8 points higher than April 2010.

10. APPLICATION TO THE SHORT-TERM FORECAST

The calculations described in this report will be used to adjust the historical data for the purposes of the short-term forecast. The same method will be used for the short-term service-unit forecast.

The eruption of Eyjafjallajökull continued during the preparation of the short-term forecast in May 2010, but by the date of publication appeared to have stopped. For short-term forecasting then and in the future, the eruption raises two large challenges:

- Adjusting historical (April and May 2010) data to help identify the underlying trend more clearly.
- Considering how to adjust the forecast for future months to allow for the uncertainty of further eruptions.

Indeed, these challenges are not entirely independent; the eruptions could have longer-lasting impact. One Swedish airline that was due to start during the April crisis has already announced that it will not begin operations for a while. It is also possible that continuing eruptions could push larger airlines into bankruptcy, though this is perhaps more likely in September-October which is traditionally a more difficult time for airline cash-flow.

For this report, we will confine our attentions to the first bullet. The second bullet was handled through a what-if? scenario that is described in the summary of the short-term forecast[16].

The STATFOR short-term forecast needs two sorts of adjustment in this case: by State and major flow; and for each of around 8,000 time series which describe traffic between pairs of traffic zones. The State and major flow adjustments are summarised in annex H. These are based on the same estimates that have already been presented. The April figures were used in the May 2010 short-term forecast. Both the April and the May figures will be used in future forecasts (September 2010 and onwards).

For each of the zone-pair traffic flows, the adjustments (which are for a monthly total) will be calculated by the method described in annex B, that is ('expected' flights - 'actual' flights), where 'expected' uses days before and after the crisis. The results are not listed here.

Adjustments to service units calculated using the same method as described for flights in annex B, that is ('expected' service units-'actual' service units), are presented in annex I. Actual data of April 2010 will be increased by these amounts when developing the service units forecast. For this version of the document, only April 2010 figures are available.

[14] *CODA Digest, Delays to Air Transport in Europe*, April 2010, CODA, June 2010, www.eurocontrol.int/coda.
[15] *First Look at Delays in May 2010,* CODA, June 2010, www.eurocontrol.int/coda.
[16] *EUROCONTROL Short-Term Forecast, Flight Movements 2010-2011*, STATFOR May 2010, www.eurocontrol.int/statfor.

A. Volcanic Ash Timeline

[Reproduced here, for the record, from the EUROCONTROL website (for April) and from Agency press statements (for May). Numbers given here refer to 'all flights known to CFMU' rather than for the airspace volumes used elsewhere in the report.]

Volcanic Ash Cloud Timeline

Discover in detail what happened during this critical event, which airspaces were closed by States and when, and how EUROCONTROL reacted.

On 14 April 2010, the EUROCONTROL Central Flow Management Unit (known as the CFMU) received the first messages relating to the volcanic eruption in Iceland, and indicating possible consequences on European air traffic.

Sunday 18 April witnessing the lowest air traffic across Europe during the crisis, with less than 20% of the usual traffic taking place.

14 April 2010

On this day there were 28,087 actual flights, compared to 27,912 on the same day the week before.

At 10.13 CET the First Air Traffic Flow Management message is sent after an email from the London Volcanic Ash Advisory Centre. VAG is published on the Network Operation Portal

At 14.30 and 18.30 CET, two teleconferences are organised, chaired by London. UK stateq that they are preparing for the worst case scenario, planning to restrict airspace.

The first regulations are applied in the evening.

Norway and the UK (Scotland) are the first countries to take measures. By midnight, Sweden and Finland have also begun to regulate parts of their airspace.

15 April 2010

On this day there are 20,842 actual flights, compared to 28,578 on the same day the week before.

During the night of 14 to 15 April, airspace closures spread all over the UK, except the south of Birmingham area

Denmark and Ireland close their airspace, and additional regulations are being applied in Sweden and Norway.

By 12.00 CET, the Netherlands, Belgium and southern Sweden start to close the airspace.

At 12.30 CET, EUROCONTROL issues a press release informing the media about the situation. The EUROCONTROL Twitter account starts answering questions from passengers, journalists and aviation professionals.

At 14.00 CET, Maastricht airspace begins to close. French airspace remains largely open until the next day, with Lille and Reims sectors closing at around 15.00 CET.

16 April 2010

On this day there are 11,659 actual flights, compared to 28,597 on the same day the week before.

The airspace of Germany as well as that of eastern and southern European countries stayed open until 16 April.

From now on press updates are being issued twice a day and the Twitter account receives many questions regarding the status of airspace closures / openings.

A press conference is organised at 17.00 CET.

17 April 2010

On this day there are 5,335 actual flights, compared to 22,653 on the same day the week before.

Air traffic regulations have been applied or extended during the night of 16 to 17 April.

From midnight 16 April, France closes the Reims, Paris and Brest regions.

The Langen (Dusseldorf and Frankfurt), Karlsruhe and Bremen sectors are closed during the night up to 12.00 CET the next day.

The Milan and Padova sectors are closed from 04.00 CET.

The Geneva and Zurich sectors are closed during the night of 17 April.

The Maastricht and Rhein sectors make requests to allow flights above FL360, this could only be done by exclusions.

Some airfields in the UK plan to open (Liverpool, Newcastle, Leeds Bradford) and there is a gradual lowering of airspace restrictions to FL210.

Estonia and Poland close their airspace too. The Munich sector starts to close at 05.30 CET.

Teleconferencing continues throughout the day, with constant adjustments and additions to the existing zero flight rates being made.

Praha closes the airspace from 11.00 CET, Slovakia from 13.10 CET and Hungary and Vienna from 17.00 CET (the latter eventually having been replaced by a Danger Area)

By 21.00 CET, Romania and Ukraine begin closing their sectors.

18 April 2010

On this day there are 5,204 actual flights, compared to 24,965 on the same day the week before.

The night of 17 to 18 April is much more stable. Most Area Control Centres have a forecast until 12.00 CET.

Northern Spain is regulated from 0000-0800, although flights below FL195 and above FL360 are excluded.

At 12.00 CET, the Volcanic Ash Advisory Centre (VAAC) indicates improvements - Madrid region cancels all regulations. Bordeaux and Marseille sectors begin to open.

At 16.00 CET, airspaces begin to open above FL200 in the following areas: Maastricht, Rhein, Bremen region, all Spain, France, Austria, Poland, Italy and Switzerland.

At 17.20 CET, Milano and Padova regions open above FL200.

19 April 2010

On this day there are 9,330 actual flights, compared to 28,126 on the same day the week before.

By 19 April the following sectors opened:
- Germany, Maastricht above FL200
- France +FL210
- Czech Republic +FL245
- Romania +FL285
- Bratislava and Switzerland above FL285
- Ukraine, Spain and Bulgaria.

Austria creates a danger area for the airspace and permitted flights at pilot's discretion.

The European Commission and EUROCONTROL organise a meeting in the morning to prepare for the EU-27 Transport Ministers meeting at 15.00 CET.

A press release presenting the revised approach to air traffic affected by the volcanic ash cloud is released.

20 April 2010

On this day there are 13,101 actual flights, compared to 27,508 on the same day the week before.

At 06.00 CET, new EUROCONTROL procedures enter into force with the map being published on the Network Operations Portal (NOP).

During the day, most of airspace is reopened, except UK which is not available until 20.00 CET.

German airspace is available below FL205 in lower airspace to VFR flights.

21 April 2010

On this day there are 21,916 actual flights, compared to 28,087 on the same day the week before.

By 09.30 CET, most European airspace opens, except sectors in Northern Scotland, Sweden, Helsinki, Finland and an area of North Western Brest airspace.

At 14.30 CET, aircraft operators teleconferences at the CFMU are suspended.

22 April 2010

On this day flights are almost back to normal, with 27,284 flights, compared to 28,578 expected on the same day two weeks ago.

During May 2010, the statements issued were as follows.

Date	Statement
04 May 2010	As of 16.00 CET on 4 May 2010, EUROCONTROL has the following update to make with regard to the situation of air traffic in Europe: At the current time, there are no airspace closures in Europe due to volcanic ash. EUROCONTROL expects approximately 28,000 flights to take place today in European airspace which is around normal levels. Airspace in Ireland, northern Ireland and small parts of western Scotland was closed between 08.00 and 14.00 CET today, resulting in the cancellation of approximately 150 flights. According to the latest Ash Concentration Charts produced by the London-based Volcanic Ash Advisory Centre, the area where ash concentrations could exceed engine manufacturer tolerance levels has shrunk and is no longer affecting any substantial part of European airspace. EUROCONTROL expects this situation to remain stable for the coming hours. The latest 'Air Ash Concentration Chart' describing those areas where no-fly zone proposals have been made to the EUROCONTROL Member States is available below:
05 May 2010	As of 09.30 CET on 5 May 2010, EUROCONTROL has the following update to make with regard to the situation of air traffic in Europe: EUROCONTROL expects approximately 28,700 flights to take place today in European airspace, which is around 300 flights below normal levels. According to the latest Ash Concentration Charts produced by the London-based Volcanic Ash Advisory Centre, the predicted area where ash concentration areas could exceed engine manufacturer tolerance levels has been covering western Scotland and Northern Ireland since 06h00 UTC (08h00 CET) this morning. Glasgow airport will be closed until 14h00 CET. Edinburgh is currently operating at reduced capacity and the western part of Scottish airspace is closed. Northern Ireland airports will also be closed until 14h00 CET. In Ireland, regional airports Knock, Sligo, Donegal will be closed until 14h00 CET. The Dublin airspace will be closed from 12h00 until 18h00 CET. Consequently, Dublin airport will also be closed for traffic. The situation is not expected to improve in this area during the day. The whole of Ireland, West Scotland and north-west England could be affected, with risk to operations at Manchester and Liverpool airports. There is no impact on overflying traffic. All measures only apply to flights below 20,000 feet. The early morning transatlantic flow was normal. The latest 'Air Ash Concentration Chart' describing those areas where no-fly zone proposals have been made to the EUROCONTROL Member States is attached. Greek airspace is also closed for all arriving, departing and domestic traffic as a result of industrial action.
06 May 2010	As of 12.00 CET on 6 May 2010, EUROCONTROL has the following update to make with regard to the situation of air traffic in Europe: There are currently no closures of airspace or airports within the European area and a normal 28,500 flights are expected today. The predicted area where ash concentration areas could exceed engine manufacturer tolerance levels lies to the west / north-west of Ireland. In the night of 5 to 6 May, renewed and more intensive ash eruptions took place. As a result the area of potential higher contamination is forecast to extend from Iceland to 50 degrees north remaining 100 to 200 miles west of Ireland. There are areas of predicted ash up to 35000 feet while over the previous few days the maximum altitude had been 20000 feet. The latest 'Air Ash Concentration Charts' describing those areas where no-fly zone proposals have been made to the EUROCONTROL Member States are attached. Significant rerouting of westbound transatlantic flights to avoid the higher contaminated area is currently being discussed between the air navigation service providers concerned and EUROCONTROL. Yesterday there were 27,904 flights within the EUROCONTROL CFMU area. This is approximately 1,300 below the normal expected number. Industrial action in Greece resulted in a cancellation of approximately 900 departing, arriving and domestic flights in Greece. Over flights were not affected. There were approximately 400 cancellations in Scotland and Ireland due to volcanic ash restrictions.
07 May 2010	As of 12.00 CET on 7 May 2010, EUROCONTROL has the following update to make with regard to the situation of air traffic in Europe:

08 May 2010	Today EUROCONTROL expects approximately 30,000 flights within the European area. While some airports were closed in the West of Ireland overnight, these are now re-opening. The main predicted area where ash concentration could exceed engine manufacturer tolerance levels lies to the west of North-West Europe, between 10 and 30 degrees longitude west. Renewed and more intensive ash eruptions took place overnight and as a result, the area of potential higher ash contamination is forecast to extend from Iceland as far south as the western edge of the Iberian Peninsula during the day. There are areas of predicted ash up to 35,000 feet while in recent days, maximum altitude had been 20,000 feet. The latest 'Air Ash Concentration Charts' describing those areas where no-fly zone proposals have been made to the EUROCONTROL Member States are attached. Transatlantic flights are being re-routed south of the affected area which could cause delays to these flights. On Thursday 6 May, there were 30,202 flights within the EUROCONTROL CFMU area, in line with normal traffic levels. As of 12.00 CET on 8 May 2010, EUROCONTROL has the following update to make with regard to the situation of air traffic in Europe: Today EUROCONTROL expects approximately 25,000 flights within the European area. Ash eruptions are ongoing and the area of potential ash contamination is expanding in particular between the ground and 20,000 feet. As a result, during the day, the area affected by volcanic ash is expected to extend from Iceland, south to Portugal and possibly as far east as Barcelona and Marseille. Airports are closed or expected to close in northern Portugal, the north of Spain and parts of southern France. The latest 'Air Ash Concentration Charts' describing those areas where no-fly zone proposals have been made to the EUROCONTROL Member States are attached. Transatlantic flights are being re-routed around the affected area which is causing substantial delays to these flights. The reduction of available airspace is also impacting flights arriving in or departing from the Iberian Peninsula and delays could be expected. On Friday 7 May, there were 30,342 flights within the EUROCONTROL CFMU area, in line with normal traffic levels.
09 May 2010	As of 12.00 CET on 9 May 2010, EUROCONTROL has the following update to make with regard to the situation of air traffic in Europe: Today EUROCONTROL expects approximately 24,500 flights within the European area which is about 500 below average for a Sunday at this time of year. Ash eruptions are still substantially affecting European airspace, in particular between the ground and 20,000 feet. Airports in the north and centre of Portugal have been affected, as have airports in north-western Spain. Airports in the Milan area are unavailable due to airspace closures until midday, and Pisa and Florence airports are also closed. During the day, it is expected that the area affected by the ash cloud will shrink and most of the airports that are currently closed are expected to open later. The latest 'Air Ash Concentration Charts' describing those areas where no-fly zone proposals have been made to the EUROCONTROL Member States are attached. Transatlantic flights continue to be affected by the ash cloud. Flights are required to make significant rerouting to avoid the area of ash cloud coverage. This is leading to some delays. However significant numbers of cancellations have not occurred. On Saturday 8 May, there were 22,424 flights within the EUROCONTROL CFMU area, which is about 200 below normal traffic levels. As of 10.00 CET on 10 May 2010, EUROCONTROL has the following update to make with regard to the situation of air traffic in Europe:
10 May 2010	Today EUROCONTROL expects approximately 28,500 flights within the European area which is about 500 below average for a Monday at this time of year. Areas of high ash concentration have dispersed overnight over continental Europe. There is an area of ash cloud in the middle of the North Atlantic which is impacting transatlantic flights. While most of these flights are operating, many are having to make significant reroutings to avoid the area of ash cloud coverage, resulting in delays. At the current time no airports are closed in Europe. According to the forecasts, during the afternoon, areas of higher ash concentration could move in a north-easterly direction from the Atlantic into the Iberian Peninsula. The latest 'Air Ash Concentration Charts', valid at 14.00CET describing those areas where no-fly zone proposals have been made to the EUROCONTROL Member States are attached. On Sunday 9 May, there were 23,491 flights within the EUROCONTROL CFMU area, which is about 1,500 below normal traffic levels. As of 10.30 CET on 11 May 2010, EUROCONTROL has the following update to make with regard to the situation of air traffic in Europe:
11 May 2010	Today EUROCONTROL expects approximately 29,000 flights within the European area which is close to normal for a Tuesday at this time of year. Areas of high ash concentration are this morning impacting southern and central Spain and Portugal including the Canary Islands and Madeira. The areas of high ash concentration on high altitudes in the middle of the North Atlantic is dispersing, easing the previously difficult situation for Trans Atlantic flights. At the current time airports on the Canary Islands, some in south-west Spain and some in Morocco are closed. According to the forecasts, during the afternoon, areas of higher ash concentration could move in a north-easterly direction cutting across the Iberian Iberian Peninsula and into south east France. These areas are of high altitude and are not expected to impact airports. The latest 'Air Ash Concentration Charts', valid at 14.00CET describing those areas where no-fly zone proposals have been made to the EUROCONTROL Member States are attached. On Monday 10 May, there were 29,155 flights within the EUROCONTROL CFMU area, which is not far from normal traffic levels. At the same time, ongoing work by the UK Met Office and the UK CAA has confirmed the effectiveness of the model used to determine the areas where ash concentration could be above engine tolerance levels. For that reason, as from noon today, the 60 nautical mile 'Buffer Zone' which was initially added to the proposed no-fly zone will be omitted. Work will continue between aircraft operators, Service Providers, the London Volcanic Ash Advisory Centre to refine the model used

	for predicting ash dispersion.
12 May 2010	As of 10.00 CET on 12 May 2010, EUROCONTROL has the following update to make with regard to the situation of air traffic in Europe: Today EUROCONTROL expects normal amounts of traffic across Europe. The areas of high ash concentration at high altitude which had caused major difficulties in recent days over the Atlantic and the Iberian Peninsula dispersed during the night. Areas of high ash concentration at lower altitudes are still causing some difficulties for trans-Atlantic flights. They are also affecting Madeira and the Azores. Areas of high ash concentration at lower altitudes, which could result in airport closures, are currently found in the Mediterranean between the Spanish mainland and the Balearic Islands, and are moving north east. At the current time all airports are available, however with the Balearic Islands airports operating at reduced capacity. According to the forecasts, the areas of higher ash concentration are expected to dissipate further during the day. The latest 'Air Ash Concentration Charts' describing those areas where no-fly zone proposals have been made to the EUROCONTROL Member States are attached. On Tuesday 11 May, there were 27,807 flights within the EUROCONTROL CFMU area, which is approximately 500 below normal traffic levels.
13 May 2010	As of 09.00 CET on 13 May 2010, EUROCONTROL has the following update to make with regard to the situation of air traffic in Europe: Today EUROCONTROL expects normal amounts of traffic across Europe with fully normal operations. The areas of high ash concentration at high altitude have now dispersed. Areas of high ash concentration at lower altitudes are well clear of routes used by European flights. The early morning trans-Atlantic flights operated normally and the same is expected for westbound flights later today. According to the forecasts, the areas of higher ash concentration are not expected to cause any disruption to air traffic during the next 24 hours. The latest 'Air Ash Concentration Charts' describing those areas where no-fly zone proposals have been made to the EUROCONTROL Member States are attached. On Wednesday 12 May, there were 29,935 flights within the EUROCONTROL CFMU area, which is normal.
14 May 2010	As of 10.00 CET on 14 May 2010, EUROCONTROL has the following update to make with regard to the situation of air traffic in Europe: Today EUROCONTROL expects normal amounts of traffic across Europe. The areas of ash concentration are mainly at low levels in the vicinity of Iceland, and according to the forecasts are not expected to cause any disruption to air traffic during the next 24 hours. The latest 'Air Ash Concentration Charts' describing those areas where no-fly zone proposals have been made to the EUROCONTROL Member States are attached. On Thursday 13 May, operations were normal with 26,852 flights within the EUROCONTROL CFMU area. Please note that future traffic updates will only be issued if there is renewed disruption to air traffic due to ash concentrations.
	15 May, 16 May no statement [There were however, some effects felt in Ireland and North West UK.]
17 May 2010	As of 10.00 CET on 17 May 2010, EUROCONTROL has the following update to make with regard to the situation of air traffic in Europe: Today EUROCONTROL expects 28,000 flights in Europe. This is approximately 1,000 less than on a normal day, and is due to the expected impact of the current closure of airspace in the south-east of the UK and in the Netherlands. The areas of ash concentration are mainly at low levels. During the course of the day, the current cloud is expected to disperse somewhat. By 14.00CET, the cloud is expected to mainly affect Northern Ireland, parts of Scotland and parts of south-west UK. There may be some continuing disruption to flights in the greater London area. Delays will also be experienced by flights due to congestion in airspace adjacent to closed areas. The latest 'Air Ash Concentration Charts' describing those areas where no-fly zone proposals have been made to the EUROCONTROL Member States are attached. On Sunday 16 May, the disruptions in Ireland and north-west UK resulted in a reduction in expected number of flights by about 400. There were a total of 25,088 flights within the EUROCONTROL CFMU area.

B. Method for estimating impact

The statistics presented here are derived from EUROCONTROL's archives of flight plans for all IFR flights in Europe, backed up with details of which flight plans were in fact activated and, in a large number of cases, radar-based confirmation of routes. During the crisis, data were made available on a daily basis through the EUROCONTROL/CFMU system to operational users, and through the STATFOR dashboard[17] (SID) to other users. Usually the data in the SID are enriched with data direct from some non-CFMU States (Iceland being of particular interest here) and from the Central Route Charges Office (CRCO) of EUROCONTROL, but due to the pressing timescales this has not been possible for this report. Iceland is discussed separately in section 6.

The statistics are reported for a number of different geographical scopes, the principal ones being:

- Total traffic on the network, ie all flights known to CFMU.
- Total traffic in some large, aggregate regions: eg the airspace of the EU27 States, or in the EUROCONTROL Statistical Reference Area (ESRA08[18])
- Traffic in the airspace of individual States. These are the volumes used for charging purposes, and match national boundaries closely. The State may provide ATC in a different airspace volume.

For forecast purposes, and hence for this report, the focus is on the second and third of these.

As the crisis unfolded, CFMU published statistics for total flights in comparison with flights in the previous week (see Figure 14). At the time, STATFOR followed the same methodology in estimating 'cancelled' flights as being the difference between flights in the week of 8-14 April and those in the same day during the crisis. Such estimates do not allow for effects such as:

- 8-14 April is near Easter, so the traffic in the following week is not necessarily that similar;
- April is a month when traffic is increasing towards the Summer peak, so that on average more traffic would be expected in 15-21 than 8-14 April;
- A significant number of observed flights were positioning or ferry flights (without passengers) as airlines sought to restore their normal operations, or repatriate stranded passengers; so the true number of 'cancelled' flights is higher than initial estimates would suggest.

Figure 14. CFMU counts of 'cancelled' flights. [estimated as difference between previous week and actual]

Date	15th	16th	17th	18th	19th	20th	21st	Total
Cancellations	7,736	16,938	17,318	19,761	18,796	14,407	6,171	101,127

For the analysis published here, the 'expected' number of flights was calculated as a weighted average of the flights on a matched day before and a day after the crisis. 'Cancelled' flights are then simply ('expected' – 'actual'). The cancellation rates are not adjusted for additional flights, though these are discussed in section 2.2. Annex C describes the validation of the method, and the particular dates and weighting used.

The flight details in our archive include aircraft type for each flight. Estimates of passenger trips disrupted are calculated from average seats per aircraft type and approximate load factors of 75% intra-Europe, 85% elsewhere (roughly based on the high load factors currently being reported by Association of European Airlines, and the fact that for many States the period included school holidays, when load factors will be high).

[17] www.eurocontrol.int/statfor/sid
[18] see www.eurocontrol.int/statfor/faq for definition of ESRA.

C. Control datasets

To test the method of using the 'matched days' in earlier and later weeks, and the relative weighting of before and after, control datasets were prepared and the number of 'cancelled' flights calculated, for periods when there was no major event and therefore no significant number of cancellations was expected. The test is that, for these control periods, the number 'cancelled' should be near zero.

The annual seasonality of the traffic series gives each month its own peculiar pattern of within-month, between-week change; therefore for the control, the same period in April was used, and only the year was changed.

Figure 15 shows the dates used for both 2010 and the control years of 2005 and 2008. No major disruptions were recorded in 2005 and 2008 on the dates labelled as 'during'. The match of days of the week is not perfect with 2010, nor is the alignment with Easter (which was on 23 March in 2008 and 27 March in 2005). Unfortunately in other years that are easily available (2003-2009), Easter fell during the period of interest, which will clearly affect the results since Easter Sunday and Good Friday reduce flights by around 20%. So these are the only two controls easily available.

In addition to two control years, four different combinations of weight were used in the weighted average: 50%, for equal weighting; 1/3-2/3 and 2/3-1/3 to emphasise reference days after and before respectively; and 1-0 to mimic the method used during the crisis, using only days before as a reference.

Figure 15. Control dates in April 2005 and 2008 (identical to 2010)

Before	'During'	After
08APR	15APR	29APR
09APR	16APR	30APR
10APR	17APR	24APR
11APR	18APR	25APR
12APR	19APR	26APR
13APR	20APR	27APR
14APR	21APR	28APR
08APR	22APR	29APR

Exactly the same code was used to calculate 'cancellations' for these years as for 2010, though any such 'cancellations' in 2005 and 2008 should be considered 'false alarms'. In fact, the same pattern of 'false alarms' cancellations was observed in both 2005 and 2008 (Figure 17), with a minimum between 0.67 and 1.0 as the weight of 'before' in the weighted average of 'before' and 'after'. This heavier weighting for the reference days before the 'event' suggests that the 'during' week has traffic more like the preceding week than the following week.

The biggest errors (not shown here) are often for the 15th & 22nd, which are being compared with days 14 days away. However, since the errors are in the same direction (eg 2005, weight 1.0), but the distant matches are in different directions, it is difficult to identify a method improvement from this.

For simplicity, this control test is taken to suggest a weight of 0.67 for the 'before' data.

Figure 16. Dates used for estimating cancellations in May 2010.

Before	'During'	After
27APR	04MAY	18MAY
28APR	05MAY	19MAY
24APR	08MAY	05JUN
02MAY	09MAY	06JUN
26APR	10MAY	07JUN
27APR	11MAY	18MAY
02MAY	16MAY	06JUN
26APR	17MAY	07JUN

Figure 17. Pattern of 'cancellations', ie false alarms, in the control periods for the ESRA08.

Control year	Weight Before	Weight After	'Cancelled'
2008	0.33	0.67	3,100
2008	0.5	0.5	1,800
2008	0.67	0.33	600
2008	1.0	0.0	-1,900
2005	0.33	0.67	3,200
2005	0.5	0.5	2,000
2005	0.67	0.33	700
2005	1.0	0.0	-1,700

In conclusion, these control datasets are not an exact match, but they support the use of a weight biased to the period before the crisis. They also suggest that the method might be expected to over-predict cancellations by up to 1,000 flights. The final method, described in annex B, uses the 2010 dates as in Figure 15 and a weight for dates before the crisis of 0.67. No attempt was made to adjust the results downwards for the slight bias which this validation process suggests.

D. Impact in the EU27

This annex complements the data in Figure 5 by providing the same figures, but for the EU27[19].

		15APR	16APR	17APR	18APR	19APR	20APR	21APR	22APR	TOTAL
1. Within Europe	Actual Flights	13,484	6,698	2,598	2,073	4,515	6,811	12,960	17,583	66,722
	Estimated Cancelled Flights	5,686	12,275	11,036	12,847	14,257	11,636	6,058	1,587	75,381
	Estimated Passengers Unable To Board (Thousands)	447	979	984	1,105	1,119	888	476	75	6,073
2. To/From Russia, Asia, non-EU Europe	Actual Flights	2,681	1,425	303	369	861	1,619	2,946	3,519	13,723
	Estimated Cancelled Flights	935	2,441	3,084	3,263	2,643	1,826	655	97	14,944
	Estimated Passengers Unable To Board (Thousands)	112	315	405	418	323	217	75	-8	1,856
3. To/From North Africa	Actual Flights	817	436	417	429	629	892	983	1,108	5,711
	Estimated Cancelled Flights	79	423	729	884	213	-110	-305	-212	1,703
	Estimated Passengers Unable To Board (Thousands)	10	58	98	120	33	-15	-41	-30	233
4. North Atlantic	Actual Flights	748	256	202	148	226	486	726	958	3,750
	Estimated Cancelled Flights	178	686	717	774	707	396	174	-32	3,600
	Estimated Passengers Unable To Board (Thousands)	34	155	168	177	163	103	52	-2	849
5. To/From Middle East	Actual Flights	556	250	143	195	245	357	623	703	3,072
	Estimated Cancelled Flights	102	329	450	512	352	251	3	-45	1,954
	Estimated Passengers Unable To Board (Thousands)	19	73	95	105	78	51	4	-9	415
6. Mid/South Atlantic	Actual Flights	235	141	134	132	148	213	263	262	1,528
	Estimated Cancelled Flights	4	106	150	172	121	34	-29	-23	537
	Estimated Passengers Unable To Board (Thousands)	3	27	37	42	32	11	-4	-5	143
7. To/From Southern Africa	Actual Flights	174	79	77	53	74	134	217	220	1,028
	Estimated Cancelled Flights	29	149	147	188	147	57	-9	-17	691
	Estimated Passengers Unable To Board (Thousands)	9	35	36	42	35	15		-3	170
8. Overflying Europe	Actual Flights	772	685	413	462	545	743	823	857	5,300
	Estimated Cancelled Flights	122	138	416	432	261	72	-4	37	1,473
	Estimated Passengers Unable To Board (Thousands)	10	14	54	57	30	10	2	-5	173
TOTAL	Actual Flights (Thousands)	19.5	10.0	4.3	3.9	7.2	11.3	19.5	25.2	100.8
	Estimated Cancelled Flights (Thousands)	7.1	16.5	16.7	19.1	18.7	14.2	6.5	1.4	100.3
	Estimated Passengers Unable To Board (Millions)	0.6	1.7	1.9	2.1	1.8	1.3	0.6	0.0	9.9

[19] Negative values are reported if the estimation method produces them; they mean that more flights took place (or larger aircraft were in use) than in the reference days before and after the crisis.

For May the results are as follows. These include approximately 1,000 flights cancelled due to the Greek general strike (5th May).

TZ EU27

		04MAY	05MAY	08MAY	09MAY	10MAY	11MAY	16MAY	17MAY	TOTAL
1. Within Europe	Actual Flights	18,635	18,141	13,220	13,691	19,087	18,284	15,010	18,139	134,207
	Estimated Cancelled Flights	304	1,473	776	1,800	212	655	481	1,160	6,860
	Estimated Passengers Unable To Travel (Thousands)	-3	109	75	156	18	49	69	72	545
2. To/From Russia, Asia	Actual Flights	3,715	3,759	3,636	3,644	3,935	3,709	3,924	3,626	29,948
	Estimated Cancelled Flights	-112	54	-62	239	-190	-106	-41	119	-99
	Estimated Passengers Unable To Travel (Thousands)	-10	9	-7	27	-5	-11	7	20	31
3. To/From North Africa	Actual Flights	776	664	1,005	1,183	783	625	1,227	795	7,058
	Estimated Cancelled Flights	9	-2	62	45	51	160	1	39	364
	Estimated Passengers Unable To Travel (Thousands)		-3	9	5	7	16	-1	7	39
4. North Atlantic	Actual Flights	914	918	959	879	883	877	987	850	7,267
	Estimated Cancelled Flights	11	0	17	118	100	48	10	133	436
	Estimated Passengers Unable To Travel (Thousands)	4	-1	2	16	10	4	-3	23	56
5. To/From Middle East	Actual Flights	583	590	557	660	571	552	648	590	4,751
	Estimated Cancelled Flights	23	8	20	11	40	54	23	21	200
	Estimated Passengers Unable To Travel (Thousands)	5	3	5	2	6	10	3	8	41
6. Mid/South Atlantic	Actual Flights	234	226	255	256	240	213	260	244	1,928
	Estimated Cancelled Flights	2	7	18	18	21	23	14	17	121
	Estimated Passengers Unable To Travel (Thousands)	1	1	5	6	5	6	4	4	32
7. To/From Southern Africa	Actual Flights	183	203	187	211	176	164	212	185	1,521
	Estimated Cancelled Flights	8	4	37	17	33	27	16	24	168
	Estimated Passengers Unable To Travel (Thousands)	2		8	2	5	4	1	4	27
8. Overflying Europe	Actual Flights	851	861	851	895	857	833	913	785	6,846
	Estimated Cancelled Flights	-38	1	53	-1	-29	-20	-19	43	-13
	Estimated Passengers Unable To Travel (Thousands)	-2		4	-2	-1	-1	-5	5	-3
TOTAL	Actual Flights (Thousands)	25.9	25.4	20.7	21.4	26.5	25.3	23.2	25.2	193.5
	Estimated Cancelled Flights (Thousands)	0.2	1.5	0.9	2.2	0.2	0.8	0.5	1.6	8.0
	Estimated Passengers Unable To Travel (Millions)	-0.0	0.1	0.1	0.2	0.0	0.1	0.1	0.1	0.8

E. Effects in May in percentage terms for States and airports

This annex gives in full the effects per State and per airport in May. Effects that may be attributed largely to the Greek general strike are low-lighted in grey. Effects near 0% are not shown. Values over 10% are highlighted in white.

Estimated Fraction Cancelled	04MAY	05MAY	08MAY	09MAY	10MAY	11MAY	16MAY	17MAY	All
Albania	10%	31%		14%			5%		7%
Austria		4%		13%					2%
Belarus		6%	3%	2%			7%		2%
Belgium/Luxembourg			6%	3%	1%	3%		1%	2%
Bosnia-Herzegovina	7%	18%		9%			7%		5%
Bulgaria		1%			1%		1%		
Canary Islands			20%			31%	1%	2%	7%
Croatia	2%	18%		9%					3%
Cyprus		7%	1%		2%	2%			1%
Czech Republic				5%				1%	1%
Denmark		2%						8%	1%
Estonia	1%	2%	4%	5%			2%	4%	2%
FYROM		34%		6%			1%		5%
Finland					1%	3%		2%	1%
France		1%	7%	12%	3%	6%			4%
Germany		1%		11%				1%	2%
Greece	14%	47%		5%			1%		7%
Hungary				4%	3%		1%	3%	1%
Ireland	24%	27%	61%	54%	52%	56%	20%	31%	41%
Italy		3%		18%					3%
Latvia	2%	4%	4%	7%				2%	2%
Lisbon FIR			9%	11%	39%	38%	1%	2%	12%
Lithuania		6%	4%	3%					2%
Malta					1%	12%		6%	2%
Moldova		6%						23%	4%
Netherlands	1%	5%					6%	30%	5%
Norway							10%	44%	7%
Poland	1%	1%						5%	1%
Romania				3%	3%		2%	3%	2%
Santa Maria FIR				14%	39%	58%			14%
Serbia&Montenegro		14%		8%					3%
Slovakia									
Slovenia	4%	15%		2%					3%
Spain		1%	14%	7%	9%	22%	1%	1%	7%
Sweden			3%					3%	1%
Switzerland				15%		1%			2%
Turkey				2%			3%		1%
Ukraine	2%	5%					3%	5%	2%
UK	3%	15%	13%	8%	2%	1%	19%	26%	11%
EU27	1%	6%	4%	9%	1%	3%	2%	6%	4%
Bodo Oceanic							3%		
ESRA08	1%	5%	4%	9%		3%	2%	7%	4%

For the airports in May the results are also quite varied: some airport have more variation from one week to the next, so the process for estimating cancellations is not as robust at this level (Nice is probably an example of this – and may be affected by the Cannes film festival 12-23 May producing the large negative values for 16/17 May in particular). The cases which are thought to be meaningful are highlighted in the following table (white for the ash cloud, grey for the general strike). It is noticeable that the 9th May, when the cloud passed over the Alps, showed a different pattern to the other days.

Rank on 18May		04MAY	05MAY	08MAY	09MAY	10MAY	11MAY	16MAY	17MAY	All
3	MADRID BARAJAS	-2%	5%	18%	7%	14%	15%	-4%	2%	7%
4	LONDON/HEATHROW	4%	6%	-10%	-9%	-6%	-4%	-9%	1%	-3%
5	MUENCHEN 2	-2%	-5%	3%	51%	-14%	-4%	-5%	-3%	2%
6	SCHIPHOL AMSTERDAM	4%	6%	-22%	1%	-0%	-5%	-1%	45%	4%
8	OSLO/GARDERMOEN	5%	2%	-8%	-1%	8%	-5%	18%	51%	10%
11	ZURICH	-2%	9%	-10%	7%	-20%	3%	-8%	-6%	-3%
13	BARCELONA	4%	7%	29%	-14%	-15%	11%	7%	6%	4%
19	LONDON/GATWICK	-6%	7%	18%	-1%	4%	4%	-5%	22%	6%
22	ATHINAI E. VENIZELOS	18%	91%	-0%	-1%	-8%	9%	4%	1%	14%
23	NICE	4%	-10%	-16%	15%	-26%	-16%	-65%	-64%	-22%
26	GENEVE COINTRIN	-22%	-21%	6%	27%	-15%	2%	-23%	-22%	-9%
27	MILANO MALPENSA	-23%	14%	3%	45%	-7%	-6%	2%	3%	5%
28	MANCHESTER	10%	-9%	20%	-1%	1%	2%	70%	-14%	10%
31	LISBOA	-1%	-2%	7%	21%	27%	-0%	-2%	-5%	6%
33	MILANO LINATE	-11%	4%	-17%	35%	-20%	-6%	-12%	-20%	-6%
35	STUTTGART	0%	-1%	-7%	26%	-11%	1%	-0%	-0%	1%
36	DUBLIN	35%	69%	11%	-8%	-5%	-14%	34%	33%	20%
38	EDINBURGH	0%	28%	14%	-26%	10%	13%	19%	29%	12%
39	TOULOUSE BLAGNAC	2%	-17%	-4%	12%	-12%	7%	5%	0%	-1%

F. Details per State (including overflights)

This annex summarises the effect on flights, including overflights that pass through the airspace but do not depart or arrive a local airport. [20]

		15APR	16APR	17APR	18APR	19APR	20APR	21APR	22APR	TOTAL
Albania	Actual Flights	385	241	169	126	289	328	473	571	2,582
	Estimated Cancelled Flights	76	183	356	426	127	53	-105	-110	1,008
	Estimated Pax Unable to Board (000s)	12	27	44	58	17	4	-18	-15	129
Austria	Actual Flights	2,758	1,263	72	41	728	1,393	2,429	3,253	11,937
	Estimated Cancelled Flights	474	1,972	2,897	3,018	2,344	1,592	655	-21	12,929
	Estimated Pax Unable to Board (000s)	60	216	329	338	268	173	71	-15	1,441
Belarus	Actual Flights	471	186	67	87	184	326	423	479	2,223
	Estimated Cancelled Flights	-15	312	428	424	283	95	67	-23	1,571
	Estimated Pax Unable to Board (000s)	-9	43	65	64	46	16	9	-12	223
Belgium/Luxembourg	Actual Flights	1,833	108	42	55	90	818	2,276	3,226	8,448
	Estimated Cancelled Flights	1,195	2,955	2,571	2,689	2,849	2,104	764	-198	14,928
	Estimated Pax Unable to Board (000s)	112	330	326	328	321	225	75	-36	1,682
Bosnia-Herzegovina	Actual Flights	495	433	61	20	210	398	620	707	2,944
	Estimated Cancelled Flights	112	210	594	593	417	177	-1	-100	2,002
	Estimated Pax Unable to Board (000s)	19	33	73	76	64	25	3	-15	277
Bulgaria	Actual Flights	960	499	145	60	370	704	1,187	1,307	5,232
	Estimated Cancelled Flights	258	787	1,067	1,274	799	440	3	-89	4,540
	Estimated Pax Unable to Board (000s)	40	112	148	178	128	72	7	-14	670
Canary Islands	Actual Flights	499	548	438	447	564	642	922	815	4,875
	Estimated Cancelled Flights	163	279	542	364	173	5	-238	-153	1,134
	Estimated Pax Unable to Board (000s)	16	38	72	50	27	4	-27	-22	158
Croatia	Actual Flights	953	711	96	57	366	648	1,114	1,301	5,246
	Estimated Cancelled Flights	245	475	1,166	1,163	767	409	-8	-103	4,115
	Estimated Pax Unable to Board (000s)	38	66	140	141	107	54		-16	530
Cyprus	Actual Flights	750	532	408	514	580	677	858	927	5,246
	Estimated Cancelled Flights	76	213	351	397	223	85	-65	-101	1,180
	Estimated Pax Unable to Board (000s)	14	33	51	58	38	6	-9	-18	172
Czech Republic	Actual Flights	1,628	238	30	27	194	590	1,259	1,738	5,704
	Estimated Cancelled Flights	219	1,612	1,553	1,733	1,571	1,133	485	109	8,416
	Estimated Pax Unable to Board (000s)	27	183	189	209	175	130	54	10	977
Denmark	Actual Flights	739	221	9	10	48	154	1,078	1,530	3,789
	Estimated Cancelled Flights	1,089	1,535	1,347	1,563	1,761	1,575	717	298	9,886
	Estimated Pax Unable to Board (000s)	113	161	157	173	175	153	71	19	1,021
Estonia	Actual Flights	366	24	13	3	19	67	235	389	1,116
	Estimated Cancelled Flights	115	442	380	429	421	338	203	92	2,420
	Estimated Pax Unable to Board (000s)	20	58	58	61	55	45	27	9	333
FYROM	Actual Flights	227	131	43	24	77	163	231	307	1,203
	Estimated Cancelled Flights	42	126	263	256	169	69	16	-38	903
	Estimated Pax Unable to Board (000s)	6	18	30	30	20	8	1	-4	110
Finland	Actual Flights	490	76	8	2	57	29	146	292	1,100
	Estimated Cancelled Flights	311	678	468	594	718	743	661	509	4,682
	Estimated Pax Unable to Board (000s)	33	65	51	60	63	63	51	33	418
France	Actual Flights	6,612	2,867	993	676	1,831	3,557	6,768	8,683	31,987
	Estimated Cancelled Flights	1,695	5,702	6,733	7,309	6,221	4,257	1,263	-376	32,804
	Estimated Pax Unable to Board (000s)	130	562	743	774	601	353	75	-78	3,160

[20] Negative values are reported if the estimation method produces them; they mean that more flights took place (or larger aircraft were in use) than in the reference days before and after the crisis.

		15APR	16APR	17APR	18APR	19APR	20APR	21APR	22APR	TOTAL
Germany	Actual Flights	6,980	1,397	120	111	359	1,647	5,284	8,612	24,510
	Estimated Cancelled Flights	1,792	7,527	7,131	7,700	8,300	6,975	3,563	160	43,146
	Estimated Pax Unable to Board (000s)	194	813	844	896	894	714	365	-1	4,719
Greece	Actual Flights	1,421	1,107	956	1,096	1,420	1,639	1,784	1,892	11,315
	Estimated Cancelled Flights	180	510	862	780	199	-128	-345	-291	1,767
	Estimated Pax Unable to Board (000s)	29	70	118	105	29	-23	-49	-46	233
Hungary	Actual Flights	1,357	564	34	36	310	697	1,283	1,545	5,826
	Estimated Cancelled Flights	233	1,084	1,433	1,604	1,169	829	251	45	6,649
	Estimated Pax Unable to Board (000s)	35	149	198	226	157	117	30	4	916
Ireland	Actual Flights	698	89	31	3	5	144	759	1,396	3,125
	Estimated Cancelled Flights	811	1,474	1,407	1,471	1,463	1,300	703	113	8,743
	Estimated Pax Unable to Board (000s)	114	251	244	247	243	219	111	12	1,441
Italy	Actual Flights	4,309	3,417	1,172	1,140	1,984	3,288	4,299	4,819	24,428
	Estimated Cancelled Flights	407	1,456	3,359	3,761	2,800	1,137	280	-103	13,096
	Estimated Pax Unable to Board (000s)	49	164	369	411	269	96	2	-38	1,321
Latvia	Actual Flights	467	30	18	9	42	135	358	561	1,620
	Estimated Cancelled Flights	138	587	521	571	529	413	203	44	3,006
	Estimated Pax Unable to Board (000s)	24	76	75	79	68	56	27	4	410
Lisbon FIR	Actual Flights	854	767	635	702	836	1,086	1,532	1,387	7,799
	Estimated Cancelled Flights	279	511	804	588	391	2	-384	-254	1,937
	Estimated Pax Unable to Board (000s)	30	56	91	57	38	-15	-54	-39	163
Lithuania	Actual Flights	528	77	53	50	111	212	416	584	2,031
	Estimated Cancelled Flights	44	522	466	509	462	333	140	-12	2,463
	Estimated Pax Unable to Board (000s)	1	64	64	68	60	38	16	-8	305
Malta	Actual Flights	218	161	164	190	219	261	281	272	1,766
	Estimated Cancelled Flights	28	77	103	75	32	-19	-60	-26	210
	Estimated Pax Unable to Board (000s)	6	15	15	10	4	-6	-12	-4	28
Moldova	Actual Flights	120	79	7	11	30	79	107	125	558
	Estimated Cancelled Flights	25	78	140	122	123	60	23	20	590
	Estimated Pax Unable to Board (000s)	4	16	24	22	22	13	4	4	110
Netherlands	Actual Flights	1,382	119	44	39	53	711	2,057	2,942	7,347
	Estimated Cancelled Flights	1,588	2,851	2,449	2,632	2,871	2,183	1,006	28	15,609
	Estimated Pax Unable to Board (000s)	177	336	326	338	331	243	126	6	1,885
Norway	Actual Flights	145	464	70	293	963	875	1,469	1,169	5,448
	Estimated Cancelled Flights	1,620	1,285	808	972	767	871	263	596	7,183
	Estimated Pax Unable to Board (000s)	119	107	74	99	72	71	34	37	613
Poland	Actual Flights	1,515	214	41	72	186	375	1,154	1,642	5,199
	Estimated Cancelled Flights	166	1,524	1,437	1,482	1,478	1,210	530	39	7,865
	Estimated Pax Unable to Board (000s)	13	176	189	190	173	132	62	-3	933
Romania	Actual Flights	1,057	621	67	36	216	652	1,071	1,189	4,909
	Estimated Cancelled Flights	148	659	1,037	1,134	900	476	143	16	4,513
	Estimated Pax Unable to Board (000s)	21	104	148	172	122	80	19		666
Santa Maria FIR	Actual Flights	293	405	385	382	494	647	593	415	3,614
	Estimated Cancelled Flights	-20	-74	-60	-67	-158	-356	-324	-142	-1,202
	Estimated Pax Unable to Board (000s)	-3	-8	-3	-4	-17	-57	-49	-24	-166
Serbia&Montenegro	Actual Flights	1,136	710	109	40	425	765	1,280	1,512	5,977
	Estimated Cancelled Flights	242	665	1,336	1,454	908	498	-3	-134	4,967
	Estimated Pax Unable to Board (000s)	41	94	170	184	130	68	3	-19	672
Slovakia	Actual Flights	766	223	21	24	183	444	752	921	3,334
	Estimated Cancelled Flights	155	732	823	902	662	403	115	-0	3,791
	Estimated Pax Unable to Board (000s)	19	96	111	122	86	61	16	-1	508

		15APR	16APR	17APR	18APR	19APR	20APR	21APR	22APR	TOTAL
Slovenia	Actual Flights	684	370	23	9	243	384	727	981	3,421
	Estimated Cancelled Flights	171	456	865	816	564	405	73	-126	3,225
	Estimated Pax Unable to Board (000s)	25	58	100	94	74	46	10	-18	390
Spain	Actual Flights	3,763	2,921	1,894	1,558	2,871	3,691	4,670	4,987	26,355
	Estimated Cancelled Flights	843	1,855	2,729	3,021	1,721	706	-190	-381	10,305
	Estimated Pax Unable to Board (000s)	90	205	310	323	186	61	-38	-62	1,075
Sweden	Actual Flights	1,040	310	16	17	366	408	925	1,523	4,605
	Estimated Cancelled Flights	1,198	1,643	1,193	1,634	1,753	1,682	1,217	715	11,034
	Estimated Pax Unable to Board (000s)	117	170	150	181	172	158	103	40	1,092
Switzerland	Actual Flights	2,612	1,105	69	55	187	1,096	2,234	2,939	10,297
	Estimated Cancelled Flights	382	1,980	2,814	2,844	2,712	1,691	685	55	13,164
	Estimated Pax Unable to Board (000s)	39	192	292	288	259	159	57	-2	1,283
Turkey	Actual Flights	2,179	1,563	1,203	1,328	1,636	1,781	2,451	2,584	14,725
	Estimated Cancelled Flights	321	980	1,237	1,343	729	538	-45	-84	5,018
	Estimated Pax Unable to Board (000s)	49	158	196	217	135	89	5	-16	834
Ukraine	Actual Flights	1,009	726	230	216	514	747	958	1,044	5,444
	Estimated Cancelled Flights	82	452	892	925	478	250	148	47	3,274
	Estimated Pax Unable to Board (000s)	13	89	147	156	92	68	38	12	615
UK	Actual Flights	1,720	312	77	73	55	443	3,965	6,185	12,830
	Estimated Cancelled Flights	4,826	6,267	5,333	5,750	6,389	5,843	2,412	361	37,179
	Estimated Pax Unable to Board (000s)	484	715	682	714	720	650	286	14	4,266
EU27	Actual Flights	19,467	9,970	4,287	3,861	7,243	11,255	19,541	25,210	100,834
	Estimated Cancelled Flights	7,135	16,546	16,728	19,072	18,703	14,163	6,543	1,392	100,282
	Estimated Pax Unable to Board (000s)	635	1,637	1,850	2,038	1,790	1,265	560	13	9,788
Bodo Oceanic	Actual Flights	17	5	12	27	35	43	39	47	225
	Estimated Cancelled Flights	14	30	17	1	-6	-11	-4	-16	26
	Estimated Pax Unable to Board (000s)	3	5	4	2		-1	-1	-3	9
ESRA08	Actual Flights	20,555	11,395	5,099	4,975	9,038	12,812	21,560	26,917	112,351
	Estimated Cancelled Flights	8,151	17,207	17,213	19,563	18,915	14,640	6,567	1,789	104,043
	Estimated Pax Unable to Board (000s)	695	1,685	1,880	2,076	1,806	1,294	566	37	10,040

In May the effects were as follows.

May effects (Greek General Strike Included)		04MAY	05MAY	08MAY	09MAY	10MAY	11MAY	16MAY	17MAY	TOTAL
Albania	Actual Flights	395	279	616	539	511	468	596	523	3,927
	Estimated Cancelled Flights	50	134	10	94	8	13	39	21	369
	Estimated Pax Unable to Board (000s)	6	14	-1	12	-8	-3	3	-9	13
Austria	Actual Flights	3,279	3,137	3,384	3,018	3,451	3,399	3,435	3,437	26,540
	Estimated Cancelled Flights	28	157	23	428	36	31	35	31	770
	Estimated Pax Unable to Board (000s)	-3	19	-18	40	-8	-12	3	-15	7
Belarus	Actual Flights	457	481	549	541	547	495	512	504	4,086
	Estimated Cancelled Flights	9	32	33	25	15	14	37	14	178
	Estimated Pax Unable to Board (000s)	2	6	3	-2	-2	1	4		13
Belgium/Luxembourg	Actual Flights	3,090	3,247	2,496	2,724	3,072	2,970	3,044	3,071	23,714
	Estimated Cancelled Flights	18	45	230	103	131	103	8	95	734
	Estimated Pax Unable to Board (000s)	-2	-13	29	18	14	21	-30	-11	25
Bosnia-Herzegovina	Actual Flights	619	554	844	724	740	705	741	777	5,704
	Estimated Cancelled Flights	44	142	43	83	40	14	62	5	433
	Estimated Pax Unable to Board (000s)	8	23	-2	8	-1	-3	8	-9	31
Bulgaria	Actual Flights	1,366	1,283	1,451	1,633	1,294	1,288	1,615	1,347	11,277
	Estimated Cancelled Flights	8	47	27	28	57	75	21	35	298
	Estimated Pax Unable to Board (000s)	-15		-2	-1	3	1	2	-7	-19

May effects (Greek General Strike Included)		04MAY	05MAY	08MAY	09MAY	10MAY	11MAY	16MAY	17MAY	TOTAL
Canary Islands	Actual Flights	642	693	692	740	779	443	691	687	5,367
	Estimated Cancelled Flights	38	27	184	4	46	278	22	45	644
	Estimated Pax Unable to Board (000s)		-1	21	-6	-19	11	1	5	11
Croatia	Actual Flights	1,168	997	1,516	1,364	1,352	1,283	1,516	1,399	10,595
	Estimated Cancelled Flights	39	235	54	148	63	14	18	20	591
	Estimated Pax Unable to Board (000s)	7	31	1	16	-5	-8	2	-15	28
Cyprus	Actual Flights	775	734	735	948	763	749	926	782	6,412
	Estimated Cancelled Flights	22	94	32	22	39	23	16	20	268
	Estimated Pax Unable to Board (000s)		13	2	-5	5	4	-2	1	18
Czech Republic	Actual Flights	1,955	1,889	1,783	1,824	1,916	1,905	1,936	1,884	15,092
	Estimated Cancelled Flights	25	25	27	124	68	56	25	59	410
	Estimated Pax Unable to Board (000s)	-13	-13	-6	11		-7	-3	5	-25
Denmark	Actual Flights	1,777	1,812	1,471	1,693	2,038	1,911	1,625	1,682	14,009
	Estimated Cancelled Flights	28	58	32	25	15	18	15	177	368
	Estimated Pax Unable to Board (000s)	-5	3	-31	-29	-42	-38	-6	11	-139
Estonia	Actual Flights	398	448	409	434	479	454	451	429	3,502
	Estimated Cancelled Flights	16	20	21	40	14	10	19	22	161
	Estimated Pax Unable to Board (000s)	-1	-1	1	7	-4	-10	2	4	-2
FYROM	Actual Flights	305	202	456	368	349	339	389	379	2,787
	Estimated Cancelled Flights	23	108	27	29	12	7	14	8	228
	Estimated Pax Unable to Board (000s)		12	-4	3	-2	-6	2	-4	1
Finland	Actual Flights	783	819	488	591	783	759	595	775	5,593
	Estimated Cancelled Flights	23	8	24	9	48	39	8	37	195
	Estimated Pax Unable to Board (000s)	-1	-2		-1	3	3	-1		
France	Actual Flights	8,247	8,212	7,244	7,188	8,092	7,587	8,453	8,404	63,427
	Estimated Cancelled Flights	163	102	667	1,012	355	574	184	319	3,376
	Estimated Pax Unable to Board (000s)	-25	-7	70	96	37	60	-15	-13	202
Germany	Actual Flights	9,060	9,080	7,644	7,305	9,233	9,180	8,328	8,895	68,725
	Estimated Cancelled Flights	37	40	32	877	61	35	17	180	1,281
	Estimated Pax Unable to Board (000s)	-10	16	-11	79	-12	-19	-2	10	51
Greece	Actual Flights	1,407	816	2,150	2,147	1,943	1,704	2,226	1,934	14,327
	Estimated Cancelled Flights	326	749	20	155	65	59	74	44	1,493
	Estimated Pax Unable to Board (000s)	20	72	-7	14	-17	-8	1	-16	58
Hungary	Actual Flights	1,775	1,659	1,682	1,817	1,635	1,711	1,885	1,631	13,795
	Estimated Cancelled Flights	12	39	5	114	86	34	21	81	392
	Estimated Pax Unable to Board (000s)	-19	-9	3	13	8	-7	1	8	-2
Ireland	Actual Flights	1,139	1,098	573	704	701	664	1,236	1,009	7,124
	Estimated Cancelled Flights	376	419	915	837	771	834	310	481	4,943
	Estimated Pax Unable to Board (000s)	48	44	190	170	164	177	28	69	889
Italy	Actual Flights	4,743	4,650	4,942	4,412	5,094	4,642	5,527	5,213	39,223
	Estimated Cancelled Flights	60	156	68	991	47	98	27	27	1,473
	Estimated Pax Unable to Board (000s)	-14	14	-6	102	-9	-7	-3	-14	63
Latvia	Actual Flights	535	570	574	568	642	617	611	582	4,699
	Estimated Cancelled Flights	17	21	22	48	6	4	14	14	146
	Estimated Pax Unable to Board (000s)	2	4	1	8	-8	-14	-1	3	-4
Lisbon FIR	Actual Flights	1,106	1,178	1,228	1,069	713	670	1,191	1,146	8,301
	Estimated Cancelled Flights	40	22	352	221	474	420	25	81	1,633
	Estimated Pax Unable to Board (000s)	-3	-10	-21	-5	47	50	1	4	63
Lithuania	Actual Flights	568	552	555	569	635	613	586	602	4,680
	Estimated Cancelled Flights	15	34	28	18	18	10	19	23	166
	Estimated Pax Unable to Board (000s)	1	5	2		-4	-3	-1	-1	-1

May effects (Greek General Strike Included)		04MAY	05MAY	08MAY	09MAY	10MAY	11MAY	16MAY	17MAY	TOTAL
Malta	Actual Flights	270	217	290	280	252	230	273	238	2,050
	Estimated Cancelled Flights	18	20	15	20	12	45	20	23	173
	Estimated Pax Unable to Board (000s)	-4	-2	-3	2	-2	4	-1	1	-4
Moldova	Actual Flights	147	131	161	162	173	170	149	129	1,222
	Estimated Cancelled Flights	10	15	9	9	11	6	10	40	112
	Estimated Pax Unable to Board (000s)	-4	-1	-1	-4		-9	3	8	-7
Netherlands	Actual Flights	2,959	2,991	2,588	2,800	3,220	3,142	2,597	2,131	22,428
	Estimated Cancelled Flights	80	193	57	36	16	52	186	945	1,566
	Estimated Pax Unable to Board (000s)	1	18	-9	-12	-28	-36	30	96	61
Norway	Actual Flights	1,776	1,813	1,127	1,482	1,977	1,908	1,169	959	12,211
	Estimated Cancelled Flights	20	56	51	16	9	16	143	759	1,069
	Estimated Pax Unable to Board (000s)	-13	-8	-52	-40	-48	-45	14	39	-153
Poland	Actual Flights	1,619	1,733	1,620	1,640	1,822	1,706	1,589	1,676	13,405
	Estimated Cancelled Flights	60	54	40	16	60	45	35	128	437
	Estimated Pax Unable to Board (000s)	-2	1		-12		-7	6	20	6
Romania	Actual Flights	1,305	1,301	1,227	1,301	1,234	1,257	1,311	1,235	10,171
	Estimated Cancelled Flights	24	55	28	109	102	35	29	87	468
	Estimated Pax Unable to Board (000s)	-8	-1	4	7	7	2	4	8	21
Santa Maria FIR	Actual Flights	335	337	563	279	218	128	348	491	2,699
	Estimated Cancelled Flights	9	16	13	75	145	179	14	29	480
	Estimated Pax Unable to Board (000s)	-5	-11	-45		18	25	-4	-28	-50
Serbia&Montenegro	Actual Flights	1,392	1,182	1,722	1,636	1,531	1,479	1,795	1,601	12,338
	Estimated Cancelled Flights	7	217	53	155	73	17	18	16	557
	Estimated Pax Unable to Board (000s)	1	28	-1	17	3	-8	-2	-11	27
Slovakia	Actual Flights	1,014	948	992	1,120	994	1,000	1,079	982	8,129
	Estimated Cancelled Flights	8	18	24	34	79	33	24	63	284
	Estimated Pax Unable to Board (000s)	-14	-5	-3	-5	-5	-11	-2	1	-43
Slovenia	Actual Flights	859	774	1,150	1,033	1,007	967	1,059	1,014	7,863
	Estimated Cancelled Flights	55	147	25	24	21	19	25	13	330
	Estimated Pax Unable to Board (000s)	10	20	-12	-1	-8	-5	2	-14	-7
Spain	Actual Flights	4,574	4,574	4,069	4,407	4,236	3,530	4,693	4,602	34,685
	Estimated Cancelled Flights	76	83	945	517	488	1,017	100	132	3,357
	Estimated Pax Unable to Board (000s)	-17	-7	39	18	35	94	8	8	180
Sweden	Actual Flights	2,162	2,214	1,247	1,676	2,263	2,177	1,675	2,022	15,436
	Estimated Cancelled Flights	33	64	47	33	25	28	23	136	390
	Estimated Pax Unable to Board (000s)	-2	3	-1	-4	-19	-19		7	-35
Switzerland	Actual Flights	3,026	3,062	2,842	2,528	3,081	2,838	3,181	3,036	23,594
	Estimated Cancelled Flights	26	18	60	488	32	62	12	20	718
	Estimated Pax Unable to Board (000s)	-12	-1	2	43	-10	1	-12	-3	7
Turkey	Actual Flights	2,604	2,596	2,798	2,989	2,679	2,585	2,971	2,669	21,891
	Estimated Cancelled Flights	44	90	77	109	81	49	118	52	620
	Estimated Pax Unable to Board (000s)	-14	2	-9	5	-10	-9	15	-7	-27
Ukraine	Actual Flights	1,049	1,160	1,273	1,359	1,244	1,203	1,257	1,101	9,646
	Estimated Cancelled Flights	71	69	29	24	36	24	66	91	410
	Estimated Pax Unable to Board (000s)		8	-4	-3	-3	-21	14	18	10
UK	Actual Flights	6,171	5,512	4,835	5,440	6,486	6,299	4,827	4,899	44,469
	Estimated Cancelled Flights	231	891	764	571	253	237	1,132	1,800	5,879
	Estimated Pax Unable to Board (000s)	37	92	118	69	32	17	113	175	653
EU27	Actual Flights	25,891	25,362	20,670	21,419	26,532	25,257	23,181	25,214	193,526
	Estimated Cancelled Flights	293	1,597	659	2,088	170	566	706	1,685	7,765
	Estimated Pax Unable to Board (000s)	-2	118	103	210	48	80	75	143	775

May effects (Greek General Strike Included)		04MAY	05MAY	08MAY	09MAY	10MAY	11MAY	16MAY	17MAY	TOTAL
Bodo Oceanic	Actual Flights	54	60	94	77	101	78	37	56	557
	Estimated Cancelled Flights	2	2	3	4	3	3	9	8	33
	Estimated Pax Unable to Board (000s)	-6	-5	-14	-8	-15	-11	-1	-8	-67
ESRA08	Actual Flights	27,968	27,527	22,101	23,184	28,754	27,471	24,849	26,750	208,604
	Estimated Cancelled Flights	251	1,497	704	2,206	210	411	775	2,187	8,240
	Estimated Pax Unable to Board (000s)	-2	119	95	213	36	64	92	170	787

G. Effect per State (excluding overflights)

This annex summarises the effect on flights, excluding overflights that pass through the airspace but do not depart or arrive a local airport. [21]

(Excluding Overflights)			15APR	16APR	17APR	18APR	19APR	20APR	21APR	22APR	TOTAL
Albania	Actual Flights		46	54	13	6	25	30	54	49	277
	Estimated Cancelled Flights		4	6	40	52	35	15	10	1	163
Austria	Actual Flights		939	496	15	11	530	714	897	1,016	4,618
	Estimated Cancelled Flights		122	582	795	884	455	232	133	45	3,248
Belarus	Actual Flights		44	26	11	16	22	33	39	43	234
	Estimated Cancelled Flights		1	20	31	22	16	13	7	2	112
Belgium/Luxembourg	Actual Flights		667	42	19	29	42	406	897	1,211	3,313
	Estimated Cancelled Flights		463	1,063	797	909	1,063	712	229	-81	5,154
Bosnia-Herzegovina	Actual Flights		35	30	4	1	19	21	39	47	196
	Estimated Cancelled Flights		6	9	22	27	20	21	2	-6	101
Bulgaria	Actual Flights		137	108	42	24	78	108	152	143	792
	Estimated Cancelled Flights		19	68	70	115	79	32	10	13	405
Canary Islands	Actual Flights		396	463	361	387	503	579	817	703	4,209
	Estimated Cancelled Flights		160	269	516	326	132	-23	-221	-147	1,012
Croatia	Actual Flights		163	132	21	33	74	99	119	182	823
	Estimated Cancelled Flights		38	59	175	139	95	68	51	19	645
Cyprus	Actual Flights		141	108	78	92	110	105	180	183	997
	Estimated Cancelled Flights		17	61	103	90	78	44	28	-25	397
Czech Republic	Actual Flights		480	124	10	7	109	223	380	512	1,845
	Estimated Cancelled Flights		46	371	351	433	392	233	97	14	1,937
Denmark	Actual Flights		465	138	2	1	4	14	636	794	2,054
	Estimated Cancelled Flights		540	757	604	748	957	922	327	211	5,065
Estonia	Actual Flights		87	11	0	0	4	18	75	111	306
	Estimated Cancelled Flights		25	99	59	82	89	70	14	1	438
FYROM	Actual Flights		32	29	5	12	16	24	30	35	183
	Estimated Cancelled Flights		2	3	20	18	13	3	2	-1	59
Finland	Actual Flights		460	57	4	2	31	3	77	182	816
	Estimated Cancelled Flights		211	566	398	492	628	653	612	489	4,047
France	Actual Flights		4,039	1,554	559	286	1,020	1,854	3,388	4,585	17,285
	Estimated Cancelled Flights		606	3,108	3,147	3,777	3,352	2,408	992	60	17,450
Germany	Actual Flights		5,095	1,043	68	69	214	1,011	3,168	5,590	16,258
	Estimated Cancelled Flights		706	4,867	4,431	4,793	5,525	4,792	2,772	211	28,098
Greece	Actual Flights		733	632	517	546	653	721	789	817	5,408
	Estimated Cancelled Flights		66	217	281	251	142	17	-25	-18	930
Hungary	Actual Flights		306	124	11	20	72	141	248	324	1,246
	Estimated Cancelled Flights		30	213	237	264	254	181	104	12	1,293
Ireland	Actual Flights		161	75	19	2	2	21	228	536	1,044
	Estimated Cancelled Flights		491	601	552	631	634	557	400	116	3,983
Italy	Actual Flights		3,173	2,600	761	738	1,114	1,936	2,733	3,277	16,332
	Estimated Cancelled Flights		260	915	2,188	2,403	2,415	1,357	687	156	10,380
Latvia	Actual Flights		149	7	1	0	2	49	122	174	504
	Estimated Cancelled Flights		34	196	146	172	186	125	46	9	914
Lisbon FIR	Actual Flights		524	433	304	321	430	465	723	757	3,957
	Estimated Cancelled Flights		190	286	411	398	292	175	-62	-43	1,647

[21] Negative values are reported if the estimation method produces them; they mean that more flights took place (or larger aircraft were in use) than in the reference days before and after the crisis.

(Excluding Overflights)			15APR	16APR	17APR	18APR	19APR	20APR	21APR	22APR	TOTAL
Lithuania	Actual Flights		106	16	5	7	30	45	92	123	424
	Estimated Cancelled Flights		14	103	80	89	80	71	26	-3	459
Malta	Actual Flights		82	60	40	46	63	67	79	112	549
	Estimated Cancelled Flights		15	26	60	53	15	25	-2	-15	178
Moldova	Actual Flights		37	33	0	2	1	27	29	34	163
	Estimated Cancelled Flights		-6	6	32	28	36	10	6	-3	109
Netherlands	Actual Flights		791	38	31	18	26	531	1,125	1,460	4,020
	Estimated Cancelled Flights		687	1,432	1,134	1,235	1,400	912	387	18	7,205
Norway	Actual Flights		136	461	64	283	936	838	1,401	1,097	5,216
	Estimated Cancelled Flights		1,527	1,180	737	885	693	815	229	566	6,632
Poland	Actual Flights		661	88	8	28	24	26	494	766	2,095
	Estimated Cancelled Flights		131	713	556	584	758	727	326	26	3,820
Romania	Actual Flights		462	354	26	6	93	278	404	458	2,081
	Estimated Cancelled Flights		6	107	299	314	369	163	80	10	1,347
Santa Maria FIR	Actual Flights		72	97	90	86	116	149	151	99	860
	Estimated Cancelled Flights		5	-17	-19	-18	-45	-85	-80	-22	-281
Serbia&Montenegro	Actual Flights		202	168	32	15	95	117	162	188	979
	Estimated Cancelled Flights		-25	24	148	166	82	59	36	-11	479
Slovakia	Actual Flights		93	41	1	1	36	72	69	109	422
	Estimated Cancelled Flights		8	43	46	57	53	20	18	-8	236
Slovenia	Actual Flights		49	45	0	1	27	20	60	113	315
	Estimated Cancelled Flights		30	39	56	60	48	47	16	-34	263
Spain	Actual Flights		3,017	2,367	1,570	1,247	2,338	2,743	3,324	3,684	20,290
	Estimated Cancelled Flights		582	1,276	1,683	2,130	1,188	700	154	-85	7,627
Sweden	Actual Flights		656	228	6	8	297	295	460	806	2,756
	Estimated Cancelled Flights		725	916	536	853	1,035	1,022	900	575	6,562
Switzerland	Actual Flights		1,142	673	24	22	28	500	1,010	1,269	4,668
	Estimated Cancelled Flights		159	638	1,177	1,224	1,244	721	276	32	5,472
Turkey	Actual Flights		1,442	1,165	907	990	1,214	1,236	1,578	1,660	10,192
	Estimated Cancelled Flights		162	512	617	663	277	252	-97	-56	2,330
Ukraine	Actual Flights		415	326	78	109	264	341	401	420	2,354
	Estimated Cancelled Flights		-1	124	295	273	120	27	8	-6	840
UK	Actual Flights		1,292	283	69	56	46	282	3,418	5,356	10,802
	Estimated Cancelled Flights		4,300	5,323	4,408	4,862	5,449	5,103	2,041	236	31,724
EU27	Actual Flights		18,695	9,285	3,874	3,399	6,698	10,512	18,718	24,353	95,534
	Estimated Cancelled Flights		7,014	16,409	16,311	18,640	18,441	14,091	6,548	1,356	98,809
ESRA08	Actual Flights		20,247	11,109	4,793	4,639	8,727	12,476	21,232	26,571	109794
	Estimated Cancelled Flights		8,128	17,171	17,170	19,534	18,921	14,647	6,564	1,804	103940

In May the effects were as follows, including the effects of the Greek general strike.

May. Excluding Overflights, but including General strike.			04MAY	05MAY	08MAY	09MAY	10MAY	11MAY	16MAY	17MAY	TOTAL
Albania	Actual Flights		46	58	48	45	56	48	51	52	404
	Estimated Cancelled Flights		5	10	7	9	4	3	6	7	51
Austria	Actual Flights		1,028	1,088	781	807	1,094	1,067	925	1,049	7,839
	Estimated Cancelled Flights		17	10	22	117	13	2	25	15	221
Belarus	Actual Flights		48	45	40	47	45	47	42	42	356
	Estimated Cancelled Flights		2	9	7	3	3	6	3	4	38
Belgium/Luxembourg	Actual Flights		1,175	1,183	800	901	1,178	1,125	974	1,111	8,447
	Estimated Cancelled Flights		12	25	56	37	48	58	3	75	314
Bosnia-Herzegovina	Actual Flights		35	41	29	29	38	37	32	41	282
	Estimated Cancelled Flights		3	6	3	3	5	7	2	5	34

May. Excluding Overflights, but including General strike.			04MAY	05MAY	08MAY	09MAY	10MAY	11MAY	16MAY	17MAY	TOTAL
Bulgaria	Actual Flights		153	154	136	155	165	131	169	184	1,247
	Estimated Cancelled Flights		8	18	22	25	33	20	17	17	159
Canary Islands	Actual Flights		559	596	596	622	597	303	593	586	4,452
	Estimated Cancelled Flights		31	21	175	3	42	268	16	36	592
Croatia	Actual Flights		217	178	255	206	199	207	247	215	1,724
	Estimated Cancelled Flights		2	20	10	43	26	12	11	20	144
Cyprus	Actual Flights		150	216	189	238	208	160	251	217	1,629
	Estimated Cancelled Flights		11	35	19	14	13	11	11	9	123
Czech Republic	Actual Flights		485	492	378	433	529	462	461	517	3,757
	Estimated Cancelled Flights		20	25	27	36	30	34	19	26	218
Denmark	Actual Flights		987	968	607	765	1,026	962	800	913	7,028
	Estimated Cancelled Flights		12	44	28	25	13	18	15	68	223
Estonia	Actual Flights		96	103	63	90	105	107	86	98	748
	Estimated Cancelled Flights		4	8	8	4	6	3	8	6	45
FYROM	Actual Flights		28	42	29	33	32	27	33	34	258
	Estimated Cancelled Flights		7	1	3	2	7	7	1	7	34
Finland	Actual Flights		654	686	396	461	666	648	479	654	4,644
	Estimated Cancelled Flights		14	6	23	7	34	23	5	25	138
France	Actual Flights		4,330	4,395	3,601	3,588	4,514	4,330	4,423	4,712	33,893
	Estimated Cancelled Flights		161	102	124	511	41	97	17	67	1,119
Germany	Actual Flights		6,064	6,150	4,691	4,292	5,968	6,084	5,199	5,900	44,348
	Estimated Cancelled Flights		22	12	30	803	44	25	5	51	992
Greece	Actual Flights		771	183	1,070	1,087	1,034	967	1,105	1,041	7,258
	Estimated Cancelled Flights		176	672	11	67	44	24	42	36	1,072
Hungary	Actual Flights		322	316	256	262	329	327	278	317	2,407
	Estimated Cancelled Flights		9	30	5	27	27	11	11	37	157
Ireland	Actual Flights		325	283	507	604	619	556	439	431	3,764
	Estimated Cancelled Flights		257	350	85	73	17	21	243	220	1,265
Italy	Actual Flights		3,429	3,494	3,016	2,582	3,588	3,283	3,429	3,629	26,450
	Estimated Cancelled Flights		33	65	62	845	27	67	22	27	1,148
Latvia	Actual Flights		185	174	157	174	209	193	178	202	1,472
	Estimated Cancelled Flights		0	5	5	5	3	1	5	7	30
Lisbon FIR	Actual Flights		675	692	537	533	431	493	744	719	4,824
	Estimated Cancelled Flights		13	12	223	217	303	177	6	38	989
Lithuania	Actual Flights		134	124	93	105	134	137	108	121	956
	Estimated Cancelled Flights		3	6	7	12	7	5	9	15	63
Malta	Actual Flights		108	88	114	98	80	109	99	77	773
	Estimated Cancelled Flights		4	4	3	16	8	5	13	11	64
Moldova	Actual Flights		33	33	36	34	44	40	47	38	305
	Estimated Cancelled Flights		6	2	1	9	5	4	0	7	34
Netherlands	Actual Flights		1,492	1,459	1,278	1,287	1,547	1,519	1,267	896	10,745
	Estimated Cancelled Flights		59	119	10	15	11	47	33	594	889
Norway	Actual Flights		1,667	1,712	829	1,203	1,699	1,671	1,085	861	10,727
	Estimated Cancelled Flights		19	53	51	16	9	16	126	758	1,048
Poland	Actual Flights		760	860	567	600	807	781	606	767	5,748
	Estimated Cancelled Flights		47	24	22	4	41	29	28	68	263
Romania	Actual Flights		458	471	313	282	464	466	336	457	3,247
	Estimated Cancelled Flights		18	25	28	56	31	13	11	33	215
Santa Maria FIR	Actual Flights		77	73	91	5	14	3	73	95	431
	Estimated Cancelled Flights		3	14	12	61	64	65	5	8	232
Serbia&Montenegro	Actual Flights		191	206	200	182	214	193	199	191	1,576
	Estimated Cancelled Flights		1	14	11	11	7	10	8	15	76

May. Excluding Overflights, but including General strike.			04MAY	05MAY	08MAY	09MAY	10MAY	11MAY	16MAY	17MAY	TOTAL
Slovakia	Actual Flights		87	86	50	65	83	97	67	86	621
	Estimated Cancelled Flights		7	11	14	16	27	14	10	29	127
Slovenia	Actual Flights		112	111	72	99	124	97	104	112	831
	Estimated Cancelled Flights		4	12	24	14	9	13	15	9	99
Spain	Actual Flights		3,629	3,570	2,773	3,298	3,381	2,936	3,564	3,602	26,753
	Estimated Cancelled Flights		76	78	738	439	320	667	100	82	2,499
Sweden	Actual Flights		1,379	1,457	547	868	1,391	1,331	883	1,305	9,161
	Estimated Cancelled Flights		11	10	29	19	25	18	19	49	181
Switzerland	Actual Flights		1,308	1,363	1,090	1,027	1,304	1,208	1,283	1,289	9,872
	Estimated Cancelled Flights		21	16	40	189	18	48	11	19	362
Turkey	Actual Flights		1,717	1,683	1,927	1,879	1,814	1,763	1,969	1,835	14,587
	Estimated Cancelled Flights		28	70	29	99	32	16	67	31	372
Ukraine	Actual Flights		374	436	426	480	467	420	433	433	3,469
	Estimated Cancelled Flights		57	37	23	8	21	21	8	24	200
UK	Actual Flights		5,399	4,777	4,254	4,676	5,625	5,406	4,031	4,299	38,467
	Estimated Cancelled Flights		98	668	367	329	132	205	924	1,414	4,137
EU27	Actual Flights		25,040	24,501	19,819	20,524	25,675	24,424	22,268	24,429	186680
	Estimated Cancelled Flights		263	1,563	625	2,064	166	550	696	1,621	7,548
Bodo Oceanic	Actual Flights		10	12	4	12	13	11	3	2	67
	Estimated Cancelled Flights		2	1	3	3	3	2	6	7	26
ESRA08	Actual Flights		27,641	27,215	21,767	22,818	28,423	27,110	24,501	26,457	205932
	Estimated Cancelled Flights		237	1,478	693	2,196	207	405	774	2,185	8,175

H. State and Flow adjustments for the Short-Term Forecast

This annex presents the results from annexes E and G in the format that will be needed for the short-term forecast. For the purposes of the forecast, the time series will be increased by these amounts in April 2010.

April 2010 adjustments (Flights/Month)			Flow			Total
			Total: Internal	Total: Arr/Dep	Total: Overflights	
Albania			.	163	846	1,008
Austria			144	3,104	9,681	12,929
Belarus			.	112	1,459	1,571
Belgium/Luxembourg			94	5,060	9,774	14,928
Bosnia-Herzegovina			0	101	1,901	2,002
Bulgaria			7	398	4,135	4,540
Canary Islands			75	938	122	1,134
Croatia			69	576	3,470	4,115
Cyprus			12	385	783	1,180
Czech Republic			61	1,876	6,479	8,416
Denmark			840	4,225	4,820	9,886
Estonia			41	397	1,982	2,420
FYROM			7	52	844	903
Finland			1,434	2,613	635	4,682
France			4,987	12,463	15,354	32,804
Germany			5,824	22,273	15,048	43,146
Greece			59	871	837	1,767
Hungary			3	1,290	5,356	6,649
Iceland			0	275	885	1,160
Ireland			239	3,744	4,760	8,743
Italy			2,129	8,251	2,716	13,096
Latvia			-1	915	2,092	3,006
Lisbon FIR			27	1,621	290	1,937
Lithuania			10	449	2,003	2,463
Malta			1	177	33	210
Moldova			-3	112	481	590
Netherlands			280	6,925	8,403	15,609
Norway			3,346	3,287	551	7,183
Poland			599	3,221	4,045	7,865
Romania			191	1,156	3,166	4,513
Santa Maria FIR			7	-288	-921	-1,202
Serbia&Montenegro			29	449	4,488	4,967
Slovakia			11	225	3,554	3,791
Slovenia			-2	265	2,962	3,225
Spain			508	7,118	2,679	10,305
Sweden			2,592	3,970	4,472	11,034
Switzerland			191	5,280	7,692	13,164
Turkey			54	2,277	2,687	5,018
Ukraine			142	698	2,434	3,274
UK			7,989	23,735	5,456	37,179
EU27			75,381	23,428	1,473	100,282
Bodo Oceanic			.	9	17	26
ESRA08			89,276	14,664	103	104,043

The figures for May 2010 will simultaneously adjust for both the ash-cloud effects and the Greek general strike.

May 2010 Adjustments (Flights/Month) Include General Strike	Flow			Total
	Total: Internal	Total: Arr/Dep	Total: Overflights	
Albania	0	59	322	381
Austria	62	191	653	906
Belarus	0	58	236	294
Belgium/Luxembourg	98	250	454	801
Bosnia-Herzegovina	6	40	450	496
Bulgaria	44	172	202	418
Canary Islands	96	551	67	714
Croatia	66	110	485	662
Cyprus	13	135	178	326
Czech Republic	63	223	285	571
Denmark	111	174	155	439
Estonia	29	29	138	196
FYROM	5	40	206	250
Finland	107	83	65	255
France	539	839	2,299	3,676
Germany	310	789	354	1,453
Greece	676	506	474	1,655
Hungary	14	199	323	536
Iceland	0	250	-3,500	-3,250
Ireland	106	1,240	4,918	6,264
Italy	445	896	414	1,755
Latvia	0	39	147	187
Lisbon FIR	190	841	681	1,711
Lithuania	19	65	148	233
Malta	4	75	138	217
Moldova	3	36	141	180
Netherlands	244	742	696	1,682
Norway	846	307	25	1,179
Poland	124	198	263	585
Romania	97	177	371	646
Santa Maria FIR	132	135	293	560
Serbia&Montenegro	24	105	504	633
Slovakia	41	116	243	399
Slovenia	12	112	270	394
Spain	1,004	1,719	894	3,617
Sweden	166	119	239	524
Switzerland	94	304	372	770
Turkey	195	317	339	851
Ukraine	144	194	375	713
UK	1,527	2,734	2,208	6,469
EU27	6,813	1,301	268	8,382
Bodo Oceanic	.	31	8	39
ESRA08	7,401	1,566	88	9,055

I. Adjustments for the Short-Term Service Units Forecast

This annex presents the estimated adjustments to service units calculated using the same method as for short-term flight forecast. For the purposes of the service units forecast, the time series will be increased by these amounts in April 2010. May 2010 adjustments will be estimated before the September 2010 update of the service-unit forecast and are not provided here.

Service Units/Month			Actual Apr10	Adjustment
EB	Belgium/Luxembourg		142,573	31,487
ED	Germany		835,211	180,519
LF	France		1,236,520	201,642
EG	UK		624,744	163,197
EH	Netherlands		165,445	40,275
Ei	Ireland		255,953	59,702
LS	Switzerland		100,997	17,705
LP	Lisbon FIR		218,145	4,871
LO	Austria		169,703	28,969
LE	Spain		699,243	38,611
GC	Canary Islands		118,572	7,011
AZ	Santa Maria FIR		328,794	-38,492
LG	Greece		332,789	10,889
LT	Turkey		641,215	56,957
LM	Malta		40,002	-3,063
LI	Italy		645,688	48,289
LC	Cyprus		112,018	4,090
LH	Hungary		135,405	23,725
EN	Norway		101,426	21,831
EK	Denmark		93,221	23,897
LJ	Slovenia		24,066	3,810
LR	Romania		218,164	39,680
LK	Czech Republic		140,618	28,409
ES	Sweden		192,331	48,681
LZ	Slovakia		53,356	9,284
LD	Croatia		97,919	15,654
LB	Bulgaria		122,330	19,170
LW	FYROM		9,677	1,411
LU	Moldova		12,921	2,679
EF	Finland		48,290	13,704
LA	Albania		27,916	2,544
LQ	Bosnia-Herzegovina		42,389	5,640
LY	Serbia&Montenegro		118,568	18,612
EP	Poland		224,003	43,836
EY	Lithuania		25,261	4,300

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