Arrival and Departure Flight Statistics for the Largest Airport Hubs

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***Abstract* – Most public datasets about Air Transport represent annual or monthly aggregated data which can be used for longer-term planning and management of airline network operations. However, in order to devise and test new processes, more instantaneous data over shorter-time periods are required. Here, we present our efforts in collecting and evaluating a one week of actual arrival and departure data for 70 largest airport hubs representing over 130 large and small airports. These airports have flight connections with almost 3,000 other airports. The flights dataset was extended with data about characteristics of almost 200 aircraft types and airport time zones.**

The flights dataset can be used to observe various statistics such as to identify peak and off-peak hours of airports, to find the number of flights between hubs and non-hubs, to find the busiest routes and to understand how different aircraft types are being deployed. From these data, we may even infer the average number of passengers and cargo volumes delivered.

Index Terms – Airport hubs, arrivals data, departures data, flights data, statistics.

INTRODUCTION

The passenger numbers and cargo volumes in Air Transport are projected to increase steadily over at least next 20 years. Such growth has to be met by the corresponding capacity increases of airports and other supporting infrastructures which often require updating the existing operational processes. One example of these new developments is our proposal for dissociating passengers from their baggage (Loskot, 2015). Such dissociation will require fundamental changes in operational, legal and safety regulations, however, once implemented, it will also enables to consider passenger-only and baggage-only airports, airport terminals and aircraft. In order to evaluate feasibility and benefits of such proposal, we need to model the airline networks including models for aircraft and airports. These models are likely to be obtained from Air Transport data. Even though Air Transport industry is collecting enormous amount of data from all levels of their operations, vast majority of this data are not publicly accessible for privacy and business reasons. For this reason, we have collected one week of arrivals and departures data for 70 largest airport hubs which may enable to test and analyse new concepts and solutions in designing and organizing airline networks and providing air transport services. However, our data does not involve operational nor capital expenditure costs which are critical factors influencing the whole Air Transport industry.

In order to cope with increasing expansion of air travel, the aviation sector has to continue innovations and investments to maintain the profitability and to respond to changes in passenger expectations. The innovation efforts in Air Transport are focusing on improvements in the efficiency of using resources, improvements in system characteristics (reduction of noise, pollution, congestion, complexity, cost) and improvements in the passenger experience (less waiting, self-sufficiency). The connected passengers are equipped with various personal smart devices, and they are becoming more demanding. The passenger bags are connected to enable their real time tracking and more efficient handling. The aircraft are connected to improve their operational efficiency. However, the connected passengers and things create new challenges, especially in terms of security and privacy.

ACRONYMS

BRS	Baggage Reconciliation System
CAA	Civil Aviation Authority
CSV	Comma-Separated Values
ETA	Estimated TOA
ETD	Estimated TOD
FAA	Federal Aviation Administration
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICT	Information and Communication Technologies
KPI	Key Performance Indicator
MLW	Maximum Landing Weight
MTOF	Maximum Take-off Weight
MZFW	Maximum Zero-Fuel Weight
OEW	Operational Empty Weight
PNR	Passenger Name Record
TCP/IP	Protocols in the Internet
TOA	Time of Arrival
TOD	Time of Departure
UTC	Coordinated Universal Time
XML	Extensible Markup Language

USE OF DATA IN AIR TRANSPORT

It is useful to understand why there is need for data in Air Transport. Air Transport sector is keen to adopt the latest ICT solutions to not only improve its profitability, but also to increase the safety and security. Since the aviation industry operates on small profit margins, it is very sensitive to changes in many factors (e.g. the fuel price, currency exchange rates, competition, deregulation) and passenger attitudes (budget vs. business travellers, seasonality, increasing expectations). The interesting recent trend in evolution of airline networks (deserving more investigation as the usual economies of scale do not apply here) is the preference for smaller, but much more fuel efficient aircraft on a number of less-busy point-to-point connections over large but less fuel efficient high-capacity aircraft deployed on hub-to-hub routes. Some airlines are now trialling low-cost long-distance routes. In addition, the fuel efficiency of aircraft has direct impact on its payload vs. range performance.

A lot of travel data is generated by provisioning passenger services starting already from flight searches and purchasing tickets (Skyscanner). Such data indicate the trends, what destinations are in demand, the preferences of passengers and how they make decisions in choosing the flights. This in turn may suggest changes in the airline networks, for example, to respond to the route demands and whether opening new flight routes would be viable. The airlines also employ complex algorithms to determine the tickets and cargo pricings. The use of ICT have enabled and will enable many new passenger services such as online check-in and baggage self-tagging. The airline operations require the use of distributed databases such as PNR and BRS. From January 2018, all baggage handling operations and ownership changes have to be recorded (IATA Resolution #753). The airlines are now adopting a new XML based messaging format and are migrating to public TCP/IP networks from the older proprietary systems. The use of open public networks (the Internet) requires using data encryption to ensure their confidentiality and integrity.

Reporting of statistical data by airlines and airports is not unified. Sometimes passengers are counted as passenger-kilometres, and it is not clear how to count transiting passengers (a passenger with one transit may be counted twice by the airlines).

The other and major issue of with data, in general, is the privacy, since travel data are the largest most sensitive, most intimately revealing, most heavily computerized and name-identified. Therefore, the agencies have to treat these data with utmost level of sensitivity, and to comply with government laws and regulations (e.g. EU).

Under the EU data protection rules, all personal data must be provided with a high standard of protection everywhere in the EU, and any persons or organisations that collect and manage personal information must protect it from misuse as well as respect the rights of the data owners. These data regulations create problems when data are shared among parties in and outside of the EU.

Even if data were anonimized and made publicly available, there is another issue with business competition. The business competition can be very intense (IATA estimates there were over 1,300 new airlines established in the past 40 years) and no company is keen to reveal, e.g., their pricing strategies via publishing their data.

In spite of large amounts of data being produced by the Air Transport industry, there are still huge opportunities to devise how to make the best use of these data. The use of data requires to develop appropriate models of systems (e.g., for predictive analytics). The data collection processes are usually driven by the KPIs whose selection is non-trivial (different KPIs are likely to lead to different dynamics of systems being managed). Some KPIs are adaptively modified to account for abnormal behaviour of systems (e.g., airline network disruption due to bad weather, or unexpected aircraft maintenance), or adjusted against the longer-term effects (e.g., seasonal adjustment of revenues).

Arrival and Departure Data for the Largest Airport Hubs

Using different public sources of Air Transport data (see Table 1), actual arrival and departure data for the 70 largest airport hubs (2015 statistics by [Wikipedia]) corresponding to 139 airports of different sizes were collected. The data span approximately one week in the summer 2016. The data records for each airport arrivals, the items reported are:

flight number, aircraft type, origin airport name and its ICAO/IATA code, ETD, TOA;

whereas for departures, we have:

flight number, aircraft type, destination airport and its ICAO/IATA code, ETD, TOA.

Thus, there are two types of airports. The main (or nominal) airports are those 139 airports that are among the 70 airport hubs considered. The other group of airports are those that either the flight originated from and then arrived to a hub airport (arrivals) or that the flight arrived to from a hub airport (departures). The collected data were stored in CSV files within a hierarchical sub-directory structure. Before the data can be analysed, the first task is to pre-process the raw data to remove their several inherent problems. The data processing was done by scripts written in Python to exploit its functionality in working with regular expressions. Thus, the raw data are first parsed to check that the records match the expected CSV pattern. About 10% of records were found not to comply, e.g., due to inclusion of extra or forgotten commas, and in some cases, missing the end-of-line character separating two records. These records were corrected by pattern matching techniques in several parsing rounds until no incorrect record was found. It is then straightforward to identify missing values and replace them with some distinctive character; we used a question mark. Similarly to checking and correcting the incorrect record patterns, it was then necessary to check all record values whether they comply with the expected format. For instance, ICAO airport codes are a group of 4 capital letters, whereas IATA airport codes are formed by 3 capital letters. This task was complicated by the use of non-standard codes for airports and aircrafts, probably in 10-15% of cases. Especially in data for the US area, the airports are sometimes designated by FAA codes. Moreover, the flight numbers, generally, does not seem to have any standardized format, even though in many cases it is possible to identify the operator from the flight number (however, the actual operator may be different due to flight sharing schemes that many airlines get involved in). In some cases, either only ICAO or IATA code was provided. Eventually, we decided to preferably use ICAO codes to denote both airports and aircraft, so if ICAO code was missing, it was supplied from another CSV file we obtained from the ICAO website. However, even ICAO aircraft codes are not unique nor complete. For instance, the aircraft code may be shared by several versions or modifications of the same aircraft type.

Another problem we encountered was the use of non-English characters in airport names. These characters were found to cause difficulties when important the CSV files into Excel spreadsheet. Therefore, we first identified all these non-standard letters, and then manually assigned each of these letters to similar letters from the English alphabet. The arrival and departure times were sometimes missing the days of week or the time zones; these missing values could be inferred from the preceding or following data records. We also tried to convert the departure and arrival times to UTC. This was a straightforward task for the times that are given for the main airports among the selected 70 airport hubs. However, the times for originating or terminating airports outside the airport hubs have the problem of not being unique, since these other airports are often located in very diverse geographical areas. We found that some time zone acronyms can resolve to as much as 4 different time zones. Even through it is possible to decode the correct time zone for a given airport knowing its geographical location, we did not find such data from the Internet for smaller and less often used airports (about 25% of the airports in the data).

EVALUATION OF ARRIVAL AND DEPARTURE DATA

The cleaned up and corrected raw data can be evaluated. We used combination of Python scripts as well as processing in Excel spreadsheets; the latter to generate tables, graphs and other data visualizations. The data processing is performed again in several stages as shown in Figure 1. We found it is useful to generate new CSV files containing results of the intermediate processing steps. It is particularly beneficial when the processing pipeline is not serialized, but various processing steps are combined in a tree-like structure (see Figure 1).

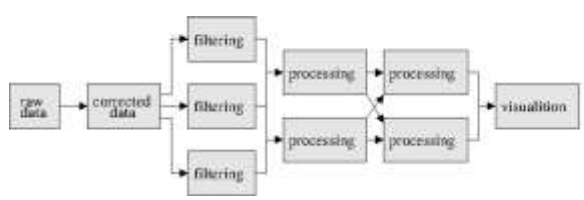

Figure 1: Data evaluation and visualization.

For instance, the filtering step usually removes data fields that are not relevant to the problem at hand. It is often easier to process and combine these intermediate data files than to devise how to work directly with the root data file.

More importantly, it was recognized that some other supporting data are required in the processing of our arrival and departure data. Specifically, we compiled a a new data file containing typical aircraft characteristics as shown in Table 2. The focus is on different weight characteristics, payloads, maximum range, fuel and seating capacity in order to obtain the payload-range curves, and to determine maximum loading of the aircraft including the delivery efficiency. The aircraft price may be used in evaluation of the flight economics. However, the aircraft price can vary significantly even for the same type of aircraft from the same manufacturer as price deals are common for bulk orders. We then also create a CSV file for airports (see Table 3) which contains, for every airport, its name, location (city and country), code designators (ICAO and IATA/FAA), the time zone shift against UTC, latitude/longitude coordinates and the size (small, medium or large). This file is partly sourced from other existing similar files we discovered on the Internet, however, data especially for small airports (time zones and locations) and many medium size airports must be searched and included manually which is a very time consuming process.

In the sequel, we will present and discuss several examples generated from our data. First, we evaluated the statistics of aircraft types for flights to/from the largest airport hubs. These statistics are shown in Table 8. It is obvious that by far, the most popular aircraft types are Airbus A320 and Boeing B737 which are deployed on short to medium routes around the world. These aircraft are especially popular by low-cost airlines who are often operating a large fleet of just one aircraft type to achieve significant acquisition and operational cost reductions (e.g., EasyJet operates only A320 while Ryanair only owns B737). The aircraft type statistics differ among Europe, Asia and America (not shown), probably reflecting the different markets, habits and flying attitudes by passengers.

Next we evaluate flights to/from airports within the London hub, i.e., Heathrow, Gatwick, Luton, Stansted and Southend with the first two airports being considered to be the hubs by themself. The basic data about these airports are given in Table 4. Table 5 lists the most connected airports from these 5 London hub airports, and we note that the number of flights is counted over one week of our data. Table 7 provides the breakdown of the origin airports for arrivals to Heathrow in and CDG airport in Paris. We can observe that the flights from non-EU and EU airports is balanced for Heathrow, while the EU flights are slightly prevailing for CDG airport. The aircraft type statistics for 5 London airports are given in Table 6. The differences among the airports are mainly reflecting the presence of different airlines (traditional versus low-cost) who specialize on different types of routes. For example, the hub-and-spike routes are flown by traditional airlines whereas direct routing is usually preferred by low-cost carriers to connect more regional (and thus, cheaper) airports.

Figures 2 and 3 compare the total number of flights for three major airport hubs selected in Europe, Asia and America. These curves confirm that there are almost no flights for several hours after midnight (noise abatement, economical and passenger convenience measures). The total daily arrivals show a three-modal distribution (three peaks) for Atlanta airport while a uni-modal distribution was found for Heathrow with the busiest day of the week being Monday. On the other hand, Beijing sees the busiest travel times to be over the weekend, from Friday to Sunday. Similar differences in the total daily number of flights (arrivals and departures) can be observed among 5 London hub airports as shown in Figure 4. Interestingly, traffic in Luton and Southend airports is mostly uniform over the week days while the busiest airports of the hub, Heathrow and Gatwick, experience largest variations over the week with a clear peak demand on Monday (Heathrow) and Friday-Sunday (Gatwick).

DISCUSSION

Even relatively short segments (one week, in this paper) of flight data can be very useful to elucidate insights into the structure and operation of airline networks. We may use this data to devise economic models or to optimize transportation of passengers and cargo delivery. Since more detailed data about flights (number of passengers actually travelled, number and weight of baggage, and cargo volume delivered) are either subject to privacy issues or business secrets, it may be sufficient that the authorities (CAA, FAA, governments, airports, airlines) would report, for example, average flight occupancy per aircraft, or average number of flights per day and similar such data that are sufficiently general to constrain their value (for reasons mentioned above), and at the same time, to be more informative than the typically reported monthly or annually aggregated values. Nevertheless, one week of our flight data can be used to infer (approximate) the values we need.

Table 1: Public sources of Air Transport data

Source	Access	Datasets
OpenFlights.org	free	search, filtering, statistics of almost 3 million flights, and API[1]
FlightRadar24.com	free/paid	info on airports and traffic, operators, real-time and historical data
Airportia.com	free	flights by airports or airlines
FlightAware.com	free/paid	extensive ADS-B support, search flights by status (cancelation, delayed etc.), real-time and historical data
ArcGIS.com[2]	free	visualization of ICAO international & domestic traffic flows with filtering capability
CAA.co.uk[3]	free	monthly updated air transport statistics for the UK
AT Multiplex project[4]	free	air transport data for major as well as low-cost airlines
Eurostat[5]	free	various statistics including transport
Enac.fr[6]	paid	large air transport datasets
BTS, USA[7]	free	wide range of transport data for the USA
arm.64hosts.com	free	program for exploring route maps of over 550 airlines
US airports project[8]	free	airport networks in the US
OAG.com	paid	commercial datafeeds for air transport
FlightGlobal.com	paid	commercial datafeeds for air transport
Skyscanner.net	paid	air tickets related statistics for commercial use
Airport websites	free	annual aggregated pax, cargo, flights statistic and other info

[1] https://github.com/jpatokal/openflights
[2] http://www.arcgis.com/home/webmap/viewer.html?webmap=abe4516f02af466db1f7c6376d485b85
[3] https://www.caa.co.uk/Data-and-analysis/UK-aviation-market
[4] http://complex.unizar.es/~atnmultiplex/
[5] http://ec.europa.eu/eurostat/data/database
[6] http://www.enac.fr/en/air-transport-database
[7] http://www.rita.dot.gov/bts/
[8] https://toreopsahl.com/datasets/#usairports

Table 2: Data sample of aircraft characteristics for most common Airbus and Boeing aircraft types

Type	MTOW [kg]	MLW [kg]	MZFW [kg]	OEW [kg]	Cargo vol. or Max. payload [kg]	Seats Typical	Seats HD	Fuel Capacity [L]	Range with max. payload [km]	Price [mil. $]
A320	73 500 - 77 000	64 500 - 66 000	62 500	42 100	18 600	150	180	23 860 - 29 840	5 350 - 5 550	98
A318	59 000 - 68 000	56 000 - 57 000	53 000	39 500	13 300	107	117	23 860	2 750 - 6 000	75
A319	75 500	62 500	58 500	40 800	27.70 m³	124	156	24 210	6 900	90
A321	93 500	77 800	73 800	48 500	51.70 m³	185	220	24 050 - 30 030	7 400	114
A330-300	233 000	182 000	175 000	173 000	158 .4 m³	295	400	139 090	10 501	254
A330-200	242 000	182 000	170 000	120 150-120 750	132.4 m³	247	406	139 090	13 450	232
A380	560 000	386 000	361 000	276 800	83 000	550	700	310 000	15 000	404
A340	271 000 - 275 000	192 000	181 000	130 900	50 900	295	440	141 500	13 100 - 13 500	238.0
A350-900	280 000	207 000	195 700	134 700–145 100	36m³ or 11 pallets	325	440	165 000	15 000	308
A350-800	259 ,000	193 ,000	181 000	?	28m³ or 9 pallets	280	440	138 000	15 400	272
A350-1000	308 000	233 000	220 000	155 000	44m³ or 14 pallets	366	440	156 000	14800	356
B737-800	B78 240 - 79 000	65 317	75000	41 413	43.6 m³	160	189	26 020	7 408	98
B737-300	62 800-68 000	51 700	48 410	32 700	23.3 m³	128	149	23 830	5 463	47
B777-300	263 080 - 299 370	237 680	224 530	155 500 - 158 480	66 050	396	550	171 170	7 500 - 11 000	279
B777-300 ER	317 520 - 351 800	251 290	237 680	168 700	68 500	396	550	181 283	11 390 -14 600	320
B737-900	79 000	66 360	62 730	42 490	20 240	177	215	26 030	5 080	69
B739 737-900ER	85 200	71 400	67 800	44 676	52.5 m³	85	215	29 660	5 900	102
B767-300	158 760	136 080	126 100	86 070	40 230	269	328	63 200	9 700	199
B767-300ER	186 880	145 150	133 810	90 010	43 800	269	328	91 380	11 000	186
B777-200ER	263 080 - 297 560	208 650 - 213 190	195 000 - 199 580	135 600 - 143 800	51 250	305	440	171 170	10 750 - 14 300	277
B777-200LR	322 050 - 347 800	220 900 - 223 170	206 840 - 209 110	155 580 - 156 030	50 850	305	440	202 500	15 040 - 17 450	314
B787-3	170 000	161 000	?	101 000	4 400 ft³	290	330	12,830 US gal (48,600)	5 500	?
B787-8	227930	172365	161 025	119 950	136.7 m³	242	359	124 700	14 500	225
B747-400	363 200 - 396 900	260 360 - 295 740	251 740	181 120	70 620	416	660	204 340 - 216 840	11 440 - 13 430	234
B747-400ER	412 780	265 740	251 740	183 840	67 900	416	660	228 250 - 241 140	13 900 - 14 200	267
B787-9	254011	192777	181437	128 850	172.5 m³	290	406	138 700	15 370	265
B747-8	440 000	306 200	288 000	211 900	76 300		467	243 400	14 800	357

Table 3: Data sample of airports

Airport Name	City	Country	IATA-FAA	IACO	Time Zone (UTC)	Latitude	Longitude	Type
Ocean Reef Club	Ocean Reef Club	United States	OCA	07FA	-5	25.3253994	-80.27480316	Small
Sky Ranch At Carefree	Carefree	United States		18AZ	-7	33.81809998	-111.8980026	Small
Honiara Int'l	Honiara	Solomon Islands	HIR	AGGH	11	-9.42800045	160.0549927	Medium
Port Moresby/Jackson Int'l	Port Moresby	Papua New Guinea	POM	AYPY	10	-9.44338036	147.2200012	Large
Keflavik Int'l	Keflavik	Iceland	KEF	BIKF	0	63.98500061	-22.60560036	Large
Reykjavik	Reykjavik	Iceland	RKV	BIRK	0	64.12999725	-21.94059944	Medium
Pristina Int'l	Pristina	Kosovo	PRN	BKPR	2	42.57279968	21.03580093	Large
Brampton	Brampton	Canada		CNC3	-5	43.76029968	-79.875	Medium
Collingwood Airport	Collingwood	Canada		CNY3	-5	44.44919968	-80.15830231	Small
Sault Ste. Marie	Sault Sainte Marie	Canada	YAM	CYAM	-5	46.48500061	-84.50939941	Medium
Campbell River	Campbell River	Canada	YBL	CYBL	-8	49.95080185	-125.2710037	Medium
Cornwall Regional	Cornwall	Canada	YCC	CYCC	-5	45.09280014	-74.56330109	Medium
Nanaimo	Nanaimo	Canada	YCD	CYCD	-8	49.05497022	-123.8698626	Medium
Centralia/James T. Field Memorial Aerodrome	Centralia, Ontario	Canada	YCE	CYCE	-5	43.28559875	-81.50830078	Medium
Chatham-Kent	Chatham-Kent, Ontario	Canada	XCM	CYCK	-4	42.3064003	-82.08190155	Small
Charlo	Charlo	Canada	YCL	CYCL	-4	47.99079895	-66.33029938	Medium
Deer Lake Regional (Newfoundland)	Deer Lake	Canada	YDF	CYDF	-4	49.21080017	-57.39139938	Medium
Edmonton Int'l	Edmonton	Canada	YEG	CYEG	-7	53.30970001	-113.5800018	Large
Elliot Lake Municipal	Elliot Lake, Ontario	Canada	YEL	CYEL	-5	46.35139847	-82.56140137	Medium

Table 4: Basic information about London hub airports

Airport	Heathrow	Gatwick	Luton	Stansted	Southend
IATA	LHR	LGW	LTN	STN	SEN
ICAO	EGLL	EGKK	EGGW	EGSS	EGMC
Latitude	51.4775	51.1481	51.8747	51.8850	51.5714
Longitude	-0.4614	-0.1903	-0.3683	0.2350	0.6956
Elevation	83	202	526	348	49
Timezone	+01:00	+01:00	+01:00	+01:00	+01:00
Runways	2 (3)	1	1	1	1
Pax annually	75 mil	40 mil	12.2 mil	22.5 mil	0.9 mil

Table 5: Most frequent origins and destinations in one week for London hub airports

EGLL				EGKK				EGGW				EGSS				EGMC			
Arrivals		Departures		Arrivals		Departures		Arrivals		Departures		Arrivals		Departures		Arrivals		Departures	
EIDW	153	KJFK	146	LEBL	159	EIDW	207	EKCH	83	EKCH	93	EIDW	102	EIDW	125	EHAM	22	EHAM	23
KJFK	145	EIDW	136	LEMG	151	LEMG	143	EHAM	69	EHAM	62	EGPH	102	EGPH	100	LPFR	18	LPFR	18
EDDF	141	EDDF	130	EIDW	147	LEBL	135	LEBL	66	EIDW	55	EGPF	83	EGPF	79	LEPA	12	LEPA	13
EHAM	136	EHAM	121	LPFR	126	LPFR	128	LLBG	52	LEBL	53	LIRA	65	LIRA	64	LEMG	12	LEMG	12
EDDM	108	LFPG	95	EHAM	126	EHAM	113	LEPA	50	LROP	51	EDDB	64	EDDK	53	LEAL	12	LEAL	12
LFPG	104	EDDM	93	EGAA	115	LEAL	96	LPFR	46	LLBG	51	LIRP	62	LEMG	52	LFPG	7	LFPG	7
OMDB	100	LSGG	92	LEMD	111	EGAA	92	LEMG	46	LHBP	51	EDDK	55	EDDB	52	LEBL	7	EGJJ	7
LSZH	97	LSZH	90	LEAL	110	LIPZ	91	EGPH	41	LEPA	47	LEMD	54	LEMD	49	EGJJ	7	LEBL	6
LSGG	97	LEMD	85	LIPZ	109	EGJJ	91	EGAA	41	LEMG	43	LIME	50	EGAA	49	LEIB	6	LIPZ	4
LEMD	88	OMDB	79	EGJJ	104	LFMN	90	LEAL	39	LPFR	40	EPMO	50	LIRP	48	LIPZ	4	LEIB	4

Table 6: Most frequent aircraft types in one week for London hub airports

EGLL				EGKK				EGGW				EGSS				EGMC			
Arrivals		Departures		Arrivals		Departures		Arrivals		Departures		Arrivals		Departures		Arrivals		Departures	
A320	1315	A320	1163	A320	1748	A320	1574	A319	536	A320	731	B738	2388	B738	2311	A319	110	A319	109
A319	864	A319	779	A319	1683	A319	1503	A320	465	A319	497	A319	395	A319	388	-	-	-	-
A321	487	A321	418	B738	533	B738	522	B738	270	B738	300	A320	59	A320	55	-	-	-	-
B77W	283	B77W	252	A321	271	A321	268	A321	95	A321	141	D328	22	D328	34	-	-	-	-
B772	233	B772	226	B772	131	B772	129	B734	25	B734	24	AT72	14	A321	17	-	-	-	-
B744	217	B744	203	E190	129	E190	110	B739	13	B739	11	DH8D	12	E190	13	-	-	-	-
B763	211	B763	195	B788	53	B744	52	B752	11	B752	9	E190	11	AT72	13	-	-	-	-
A388	209	A388	182	B744	52	B788	49	B763	8	B737	8	A321	11	A332	13	-	-	-	-
B789	139	B789	119	A332	49	B763	49	B733	8	GLF4	7	MD11	10	DH8D	11	-	-	-	-
B788	126	32A	114	B763	48	A332	49	CL60	6	B763	7	B77L	10	B77L	10	-	-	-	-

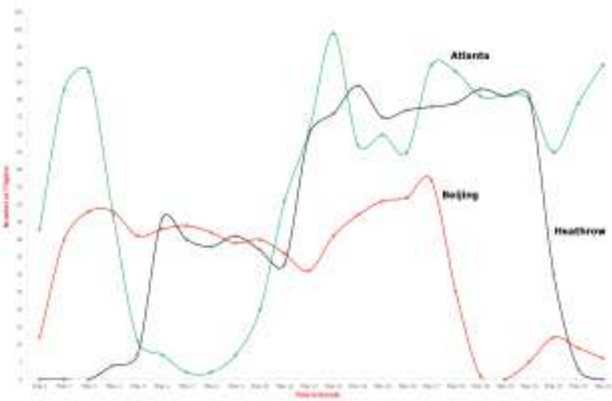

Figure 2: Number of arrivals over a typical week day for 3 selected large airports.

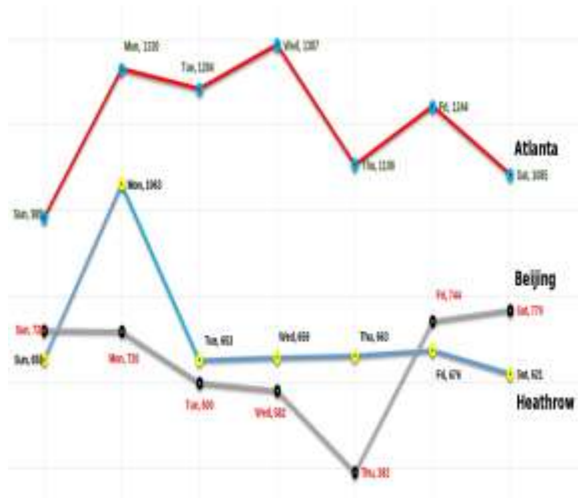

Figure 3: Daily number of arrivals distribution over a week for 3 selected large airports.

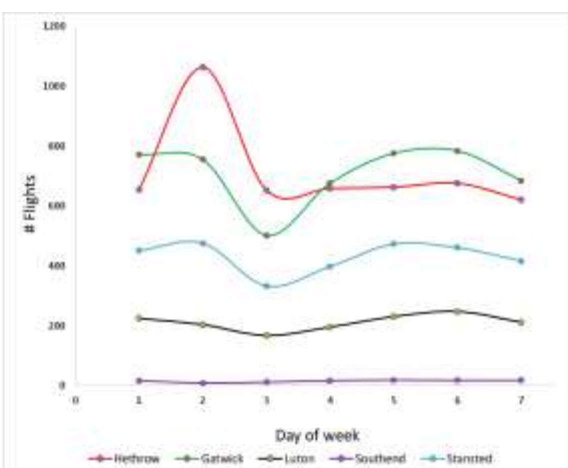

Figure 4: The total daily number of arrivals and departures for 5 London hub airports.

Table 7: The origin airports distribution for 2 large European hub airports.

Flights	Heathrow	CDG Paris
Outside EU	44%	41%
Inside EU	44%	49%
Domestic	12%	10%

Table 8: The aircraft type statistics for one week of data in 70 largest airport hubs.

Type	%	Type	%
A320	19.1	B739	1.9
B738	18.1	B763	1.5
A319	7.3	A332	1.5
A321	6.9	CRJ7	1.4
B737	6.2	B752	1.4
E170	3.3	B772	1.4
A333	2.5	DH8D	1.1
CRJ9	2.1	B733	1.0
E190	2.1	E135	1.0
B77W	2.0	B788	0.9

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