



Air traffic in Germany

Mobility Report 2017

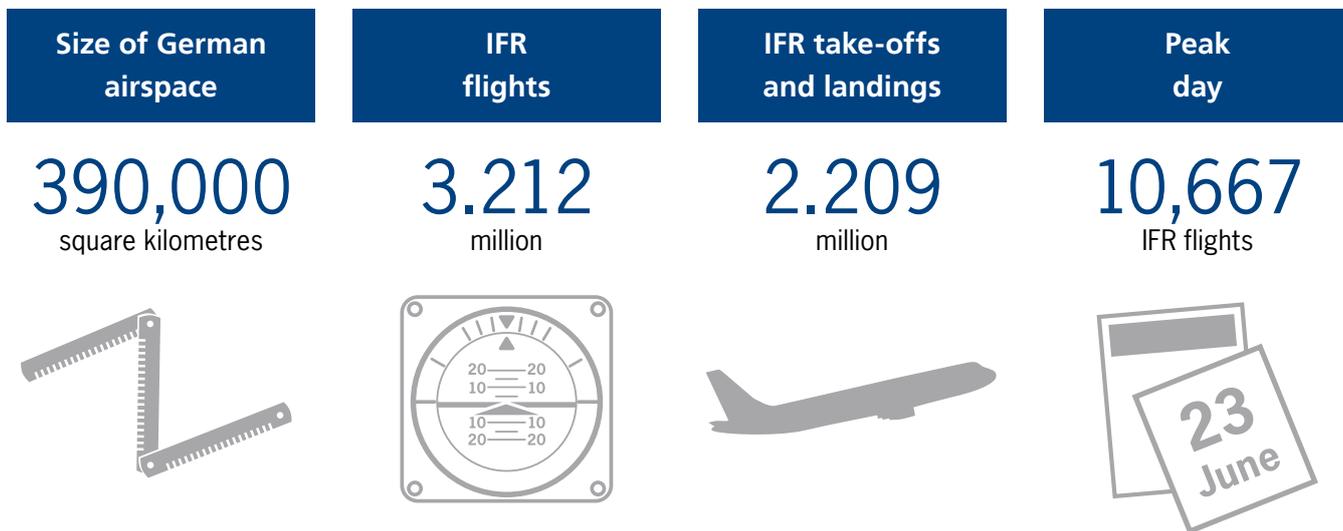


DFS Deutsche Flugsicherung



The year 2017

Air traffic in German airspace



Safety

Infringements of separation (en-route) Per 1 million flight hours (RAT ABC)



Infringements of separation (terminal) Also includes runway incursions per 100,000 aircraft movements (RAT ABC)



Punctuality

ATFM delay en-route Delay per flight in minutes (ATC-related)



ATFM delay arrival Delay per flight in minutes (ATC-related)



Environment

Horizontal flight efficiency Deviation from the direct route



*ca. 3.9 km

2017 – A record year

Every year, the German air navigation service provider DFS and its 5,400 staff ensure that millions of passengers reach their destinations safely and on time. The year 2017 was a record year in German airspace as regards the number of flights. The metrics we use to judge the quality of our services show that it was also a good year for passengers and airlines despite the record volume of traffic we had to manage. The DFS Mobility Report provides you with information on important developments and trends in aviation from Germany, Europe and around the world.





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New record for air traffic in Germany

The year 2017 was the busiest year in German airspace, with more than 3.2 million controlled flights.



In 2017, the number of flights under instrument flight rules (IFR) controlled in German airspace was exactly 3,211,771. This broke the record set in 2008. In 2017, growth accelerated compared with the previous year, with traffic volumes in Germany rising by around 3.3 percent (2016: 2.6 percent). This annual increase was again slightly lower than the EU country average of 3.8 percent for the year. We can see that the record achieved in German airspace was primarily due to the rise in air traffic in neighbouring countries. According to EUROCONTROL data, around 9.6 million flights were controlled in the EU Member States in 2017. About a third of these flights came under the responsibility of DFS and its air traffic controllers. The fact that the traffic growth in Europe was higher than the growth in Germany is reflected in the growing share of overflights. At 38.6 percent, these

overflights make up the largest share of the flights controlled in Germany. Entries to and exits from German airspace each made up 25.7 percent of IFR flights. The share of purely domestic traffic declined again. Only 10 percent of the flights took off from and landed on German territory in 2017 (2016: 10.5 percent). In 2017, the number of take-offs and landings at the designated international airports in Germany increased by 1.6 percent. Leipzig Halle Airport had a particularly good year in 2017. The second-largest cargo airport in the country benefitted from the rise in freight traffic. In 2017, 7.3 percent more flights took off from and landed in Leipzig. Nürnberg Airport also experienced a significant rise in flight movements (+7.2 percent).

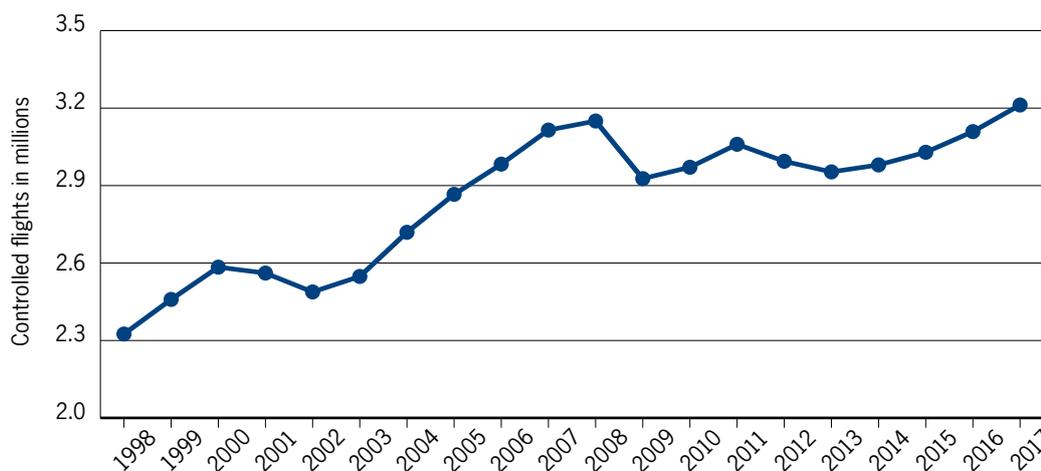
At the regional airports, the trend reversed a little, following the slump seen in the previous year (2016: -8.4 percent).



38.6
PERCENT

of all flights in German airspace are overflights. The number of such flights rose, while purely domestic flights declined.

Traffic numbers over the long term

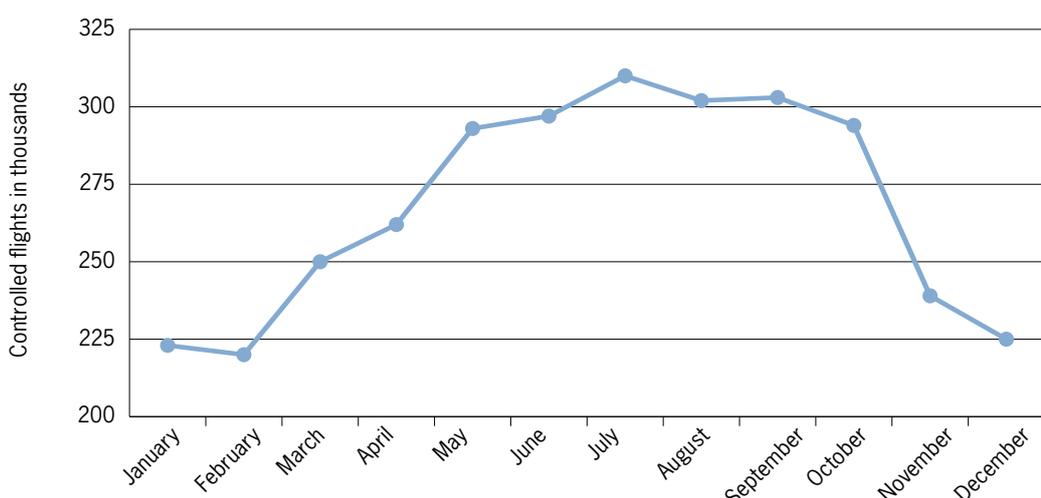


Source: DFS

1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2.325	2.459	2.584	2.561	2.488	2.548	2.719	2.866	2.983	3.115	3.150	2.927	2.971	3.060	2.994	2.953	2.980	3.029	3.109	3.212

In 2017, air traffic controllers handled around 3,212,000 flights under instrument flight rules in German airspace, a rise of 3.3 percent over the previous year. This exceeded the record of 3.15 million IFR flights set in 2008.

Traffic by month

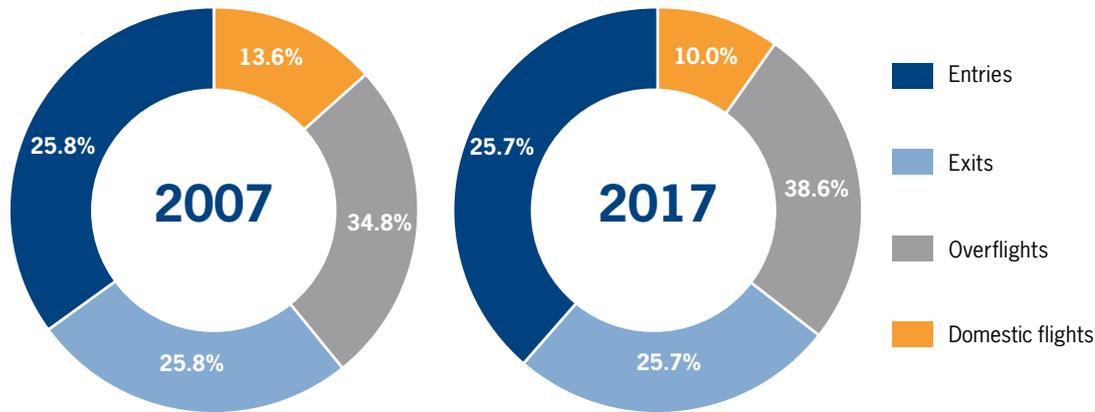


Source: DFS

Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
223.000	220.000	250.000	262.000	293.000	297.000	310.000	302.000	303.000	294.000	239.000	225.000

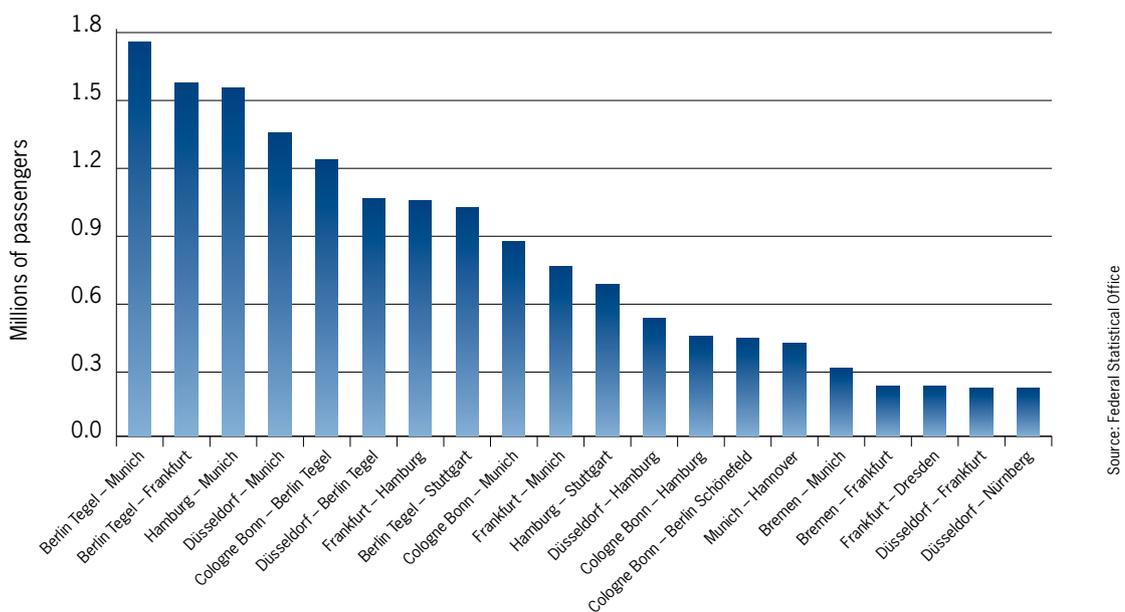
With around 310,000 controlled flights, July was the busiest month of 2017. On 23 June, 10,667 IFR flights were recorded in German airspace – more than on any other day of the year.

Traffic segments



At the turn of the millennium, overflights made up less than a third of the air traffic volume in German airspace. By 2017, their share had risen to 38.6 percent. During the same period, the percentage of domestic flights almost halved.

Main domestic connections



According to the German Federal Statistical Office, just under 24 million passengers travelled on domestic flights within Germany in 2017. Berlin – Munich, Berlin – Frankfurt and Hamburg – Munich were the most popular routes.



IFR take-offs and landings at Germany's international airports

	2013	2014	2015	2016	2017	Change in %
Berlin Schönefeld	63,092	66,881	74,355	94,886	99,870	5.3
Berlin Tegel	173,979	181,532	183,696	184,974	173,045	-6.4
Berlin in total	237,071	248,413	258,051	279,860	272,915	-2.5
Bremen	35,107	36,538	34,211	32,861	30,246	-8.0
Dresden	22,333	23,502	22,823	22,727	21,450	-5.6
Düsseldorf	210,264	209,771	209,361	216,875	220,904	1.9
Erfurt	4,796	4,883	4,869	4,907	5,455	11.2
Frankfurt	472,549	468,915	468,027	462,742	475,365	2.7
Hamburg	136,605	146,315	149,939	151,785	153,931	1.4
Hannover	64,157	62,914	62,320	61,797	62,401	1.0
Cologne Bonn	119,538	122,184	127,356	135,391	139,760	3.2
Leipzig Halle	59,467	60,482	62,417	61,488	65,963	7.3
Munich	379,107	374,110	377,082	391,521	401,728	2.6
Münster Osnabrück	16,322	17,678	17,611	16,808	18,223	8.4
Nürnberg	51,943	49,901	48,665	49,495	53,074	7.2
Saarbrücken	9,548	8,567	9,945	9,285	8,787	-5.4
Stuttgart	114,082	113,798	118,931	118,918	117,939	-0.8
Total	1,932,889	1,947,971	1,971,608	2,016,460	2,048,141	1.6

IFR take-offs and landings at Germany's regional airports

	2013	2014	2015	2016	2017	Change in %
Altenburg Nobitz*	300	349	-	-	-	-
Augsburg	6,788	6,887	6,732	6,516	7,049	8.2
Braunschweig	12,206	11,965	11,727	10,471	9,784	-6.6
Dortmund	19,791	20,097	20,114	19,262	20,220	5.0
Friedrichshafen	11,974	11,861	12,393	10,109	9,919	-1.9
Hahn	23,939	20,570	20,957	20,634	20,662	0.1
Heringsdorf	1,115	1,210	984	982	838	-14.7
Hof Plauen	1,393	1,902	1,515	1,313	1,488	13.3
Ingolstadt Manching	6,616	6,987	6,601	5,529	5,669	2.5
Karlsruhe Baden-Baden	15,776	14,640	13,930	12,707	13,016	2.4
Kassel Calden	2,950	3,345	3,788	3,792	4,342	14.5
Lahr	606	1,444	1,461	1,493	1,543	3.3
Lübeck -Blankensee	5,869	4,861	4,310	2,284	1,922	-15.8
Magdeburg Cochstedt**	948	701	1,246	518	5	-99.0
Mannheim	4,934	5,704	6,309	6,591	6,460	-2.0
Memmingen	9,175	8,933	11,298	10,541	11,681	10.8
Mönchengladbach	4,796	5,472	5,726	5,072	6,025	18.8
Niederrhein	18,897	13,567	13,187	12,714	13,066	2.8
Paderborn Lippstadt	13,635	12,857	13,048	12,666	12,805	1.1
Rostock Laage	9,777	9,381	8,449	6,866	7,880	14.8
Schwerin Parchim	1,487	1,519	1,768	1,320	1,056	-20.0
Westerland Sylt	4,862	5,032	5,553	5,359	5,717	6.7
Zweibrücken*	4,457	3,743	-	-	-	-
Total	182,291	173,027	171,096	156,739	161,147	2.8

At Germany's designated international airports, 1.6 percent more flights were conducted in 2017. Traffic at the regional airports – which had been declining – rebounded, with the number of take-offs and landings rising by 2.8 percent. This table is based on all take-offs and landings under instrument flight rules (IFR). Domestic flights count as two aircraft movements – one take-off and one landing.

* Altenburg and Zweibrücken are no longer classified as regional airports (since 2015).

** Until further notice, flight operations at Magdeburg Cochstedt Airport have been discontinued (since September 2016).



More than **10 THOUSAND**

flights were recorded in German airspace on 23 June 2017 – more than on any other day of the year

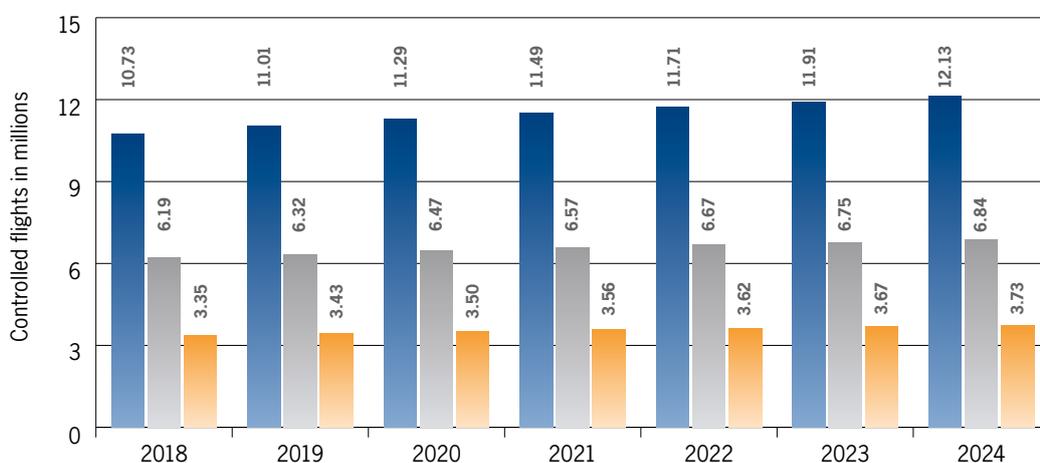
These airports experienced around 2.8 percent more take-offs and landings over the previous year. While the busiest regional airport (Frankfurt Hahn) basically stagnated (+0.1 percent), Dortmund Airport, the second busiest regional airport, recorded above-average growth. Higher frequencies on some routes and new connections to Eastern Europe and North Africa led to a rise in traffic of 5.0 percent in Dortmund. The growth at Memmingen Airport was especially high. This airport in the far south of Germany saw traffic advance by 10.8 percent. Ryanair stationed a new aircraft there in 2017, which opened up new destinations.

Summer time is holiday time and holiday time is travel time – this truth remained unchanged in 2017. With around 310,000 controlled flights, July was the busiest month of the year. The busiest day also fell in a typical holiday month.

On 23 June, exactly 10,677 flights were controlled. This number only includes IFR flights.

According to EUROCONTROL forecasts, the rise in traffic will continue in 2018. EUROCONTROL expects 2.7 percent more flight movements in Germany, totalling 3.4 million controlled flights. It expects growth to slacken off in the subsequent years, forecasting an average growth rate of 1.9 percent per year until 2024. This would put Germany slightly below the average for the EU States, which are forecast to see a rise of 2.1 percent.

Future trend for IFR traffic



Source: Low-growth forecast EUROCONTROL

Change over previous year	2018	2019	2020	2021	2022	2023	2024
Europe	3.3%	2.6%	2.5%	1.8%	1.9%	1.7%	1.8%
FABEC	2.4%	2.1%	2.2%	1.5%	1.6%	1.2%	1.4%
Germany	2.7%	2.4%	2.2%	1.7%	1.7%	1.4%	1.5%

EUROCONTROL recalculates its air traffic forecast twice a year with three scenarios. These include a conservative, an optimistic and a third scenario somewhere between the two extremes. This middle scenario is shown in the visual. In this scenario, the number of flights in German airspace will rise by around half a million until 2024.

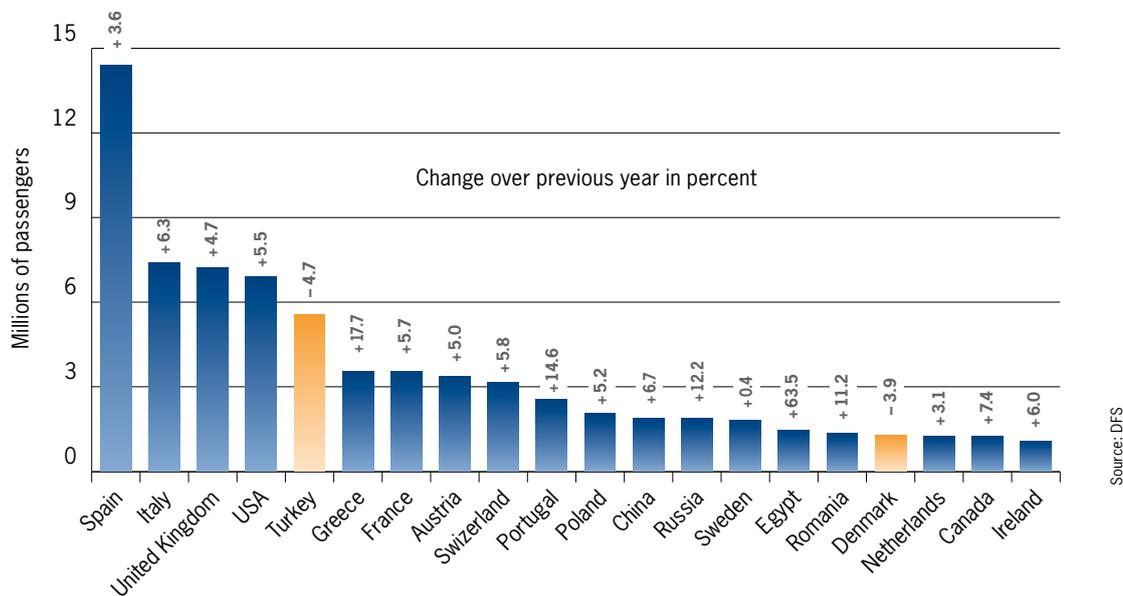
After the terror: How the travel behaviour of German tourists has changed.

Egypt is recovering from the collapse in numbers seen in 2016, while Turkey continues to lose visitors and Spain keeps its top ranking as the favourite holiday destination of the Germans.

The year 2016 saw a change in travel behaviour as tourists reacted to terror threats by avoiding Egypt and Turkey. The number of flights to both countries from Germany declined. This decline has been arrested for Egypt. In 2017, passenger numbers there rose by almost two thirds. Flights to Turkey, however, continued their downward trend, experiencing a decrease of 4.7 percent. This decrease slackened off considerably compared with the decline seen the year before, when the number of flights sank by a fifth. Turkey remains in fifth place in the ranking of top destinations, while Egypt has re-entered the top 20.

Greece (+17.7 percent) and Portugal (+14.6 percent) experienced significant increases. These countries are considered as alternatives to Spain, which itself remains the clear favourite as the top holiday destination of the Germans. More than 14 million passengers boarded flights from Germany to either the Spanish mainland, the Balearic Islands or the Canary Islands in 2017. This represents a further increase of 3.6 percent over the previous year. Italy, which ranks second, saw only half as many passengers. The United Kingdom and the United States follow close behind.

Top 20 destinations



While the number of travellers to Turkey declined, other countries, particularly Spain, benefitted. In 2017, around 14.4 million people flew to the Spanish mainland, the Balearic Islands or the Canary Islands. Greece recorded even higher growth.



14.4
MILLION

passengers
travelled from
German airports
to Spain in 2017.

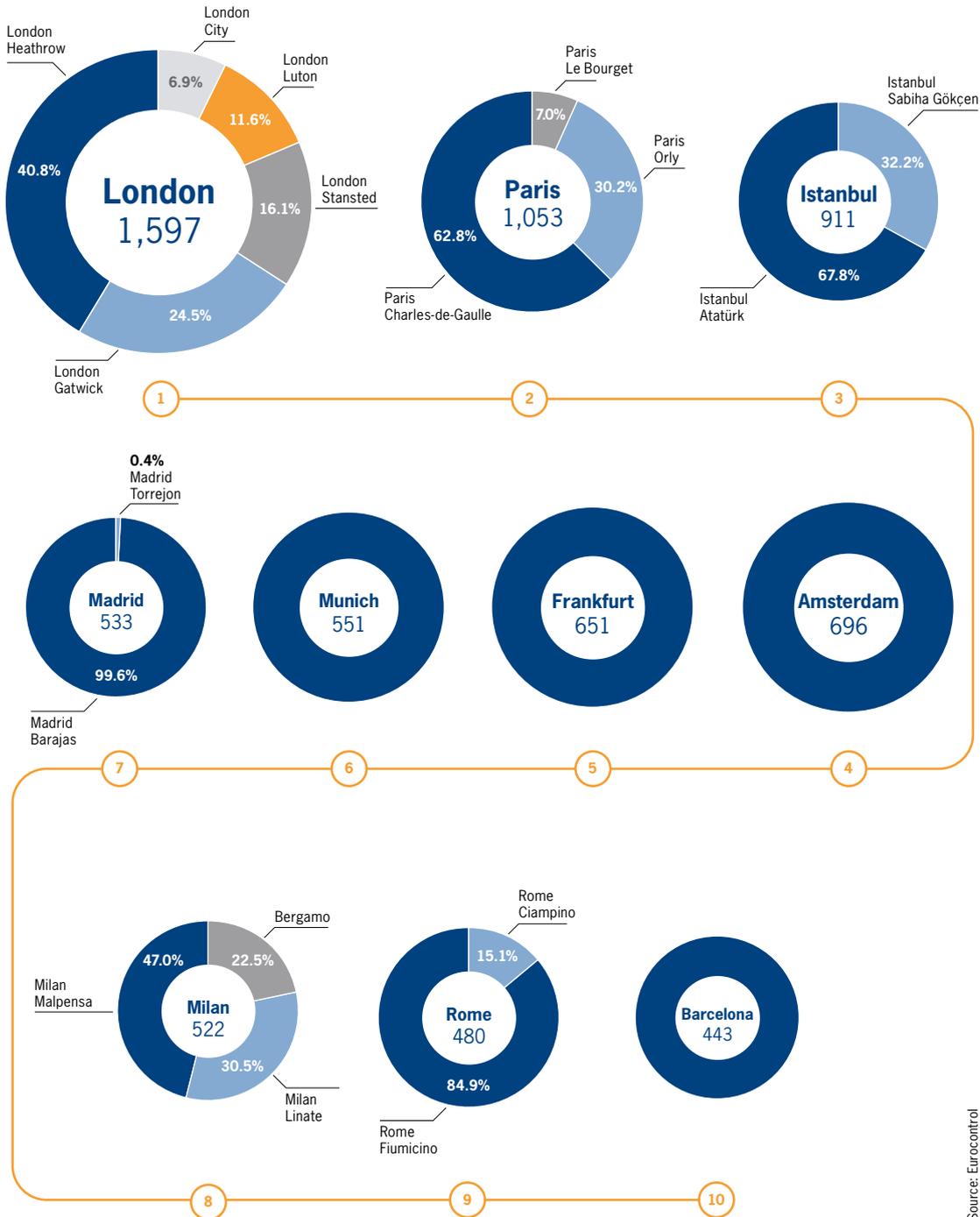
The changes in travel flows are reflected in the traffic seen in other EU States. According to EUROCONTROL, traffic to Mediterranean countries rose at above-average rates in 2017: Cyprus (+11.6 percent), Portugal (+9.5 percent), Croatia (+8.7 percent) and Greece (+6.5 percent). Eastern Europe also recorded a higher volume of traffic. Slovenia (+9.3 percent), Latvia (+8.9 percent), Romania

(+8.5 percent) and Estonia (+7.5 percent) saw significantly more take-offs and landings in 2017 over 2016.



European metropolitan airports

Average number of departures per day



Source: Eurocontrol

Europe's busiest airports are located in and around London. The airports of Heathrow, Gatwick, Stansted, Luton and City see an annual average of just under 1,600 take-offs per day. These figures only consider flights under instrument flight rules. The statistics include airports located up to 50 kilometres from the city centre with at least one aircraft movement per day.



Global traffic record

The number of passengers across the globe broke the four-billion mark for the first time in 2017. In Germany, passenger numbers rose by 5.7 percent.



77.6
PERCENT

of all seats in
airliners are filled.
Load factors
thus reached a
record high.

Statistically speaking, half of the global population travelled by aeroplane in 2017. The International Air Transport Association (IATA) reported that the number of airline passengers rose to around 4.1 billion, breaking the record high of 2016 (3.8 billion passengers). The number of passenger kilometres went up correspondingly (number of passengers multiplied by kilometres flown). This figure rose by 7.6 percent over the previous year according to IATA.

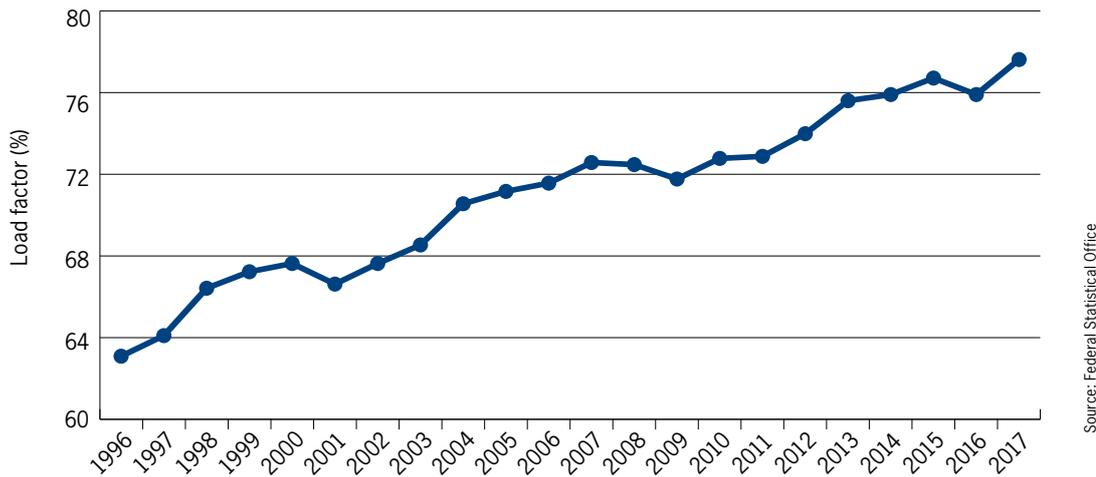
A new record high in passenger numbers was also seen in Germany. According to the German Federal Statistical Office, around 213 million passengers used German airports in 2017, a rise of 5.7 percent over 2016. As in previous

years, the rise in the number of passengers was stronger than the rise in the number of flights. This underlines that airlines are keeping a close eye on the profitability of their routes and are trying to use their capacity as efficiently as possible. Load factors went up correspondingly. They reached a record level according to the German Federal Statistical Office, rising to 77.6 percent in 2017. This is 0.9 percentage points more than in the record year of 2015.

This growth in traffic means that the busy skies above Europe's metropolitan areas continued to get busier. The London metropolitan area has the busiest airspace. The airports serving London have an average 1,597 departures per day,

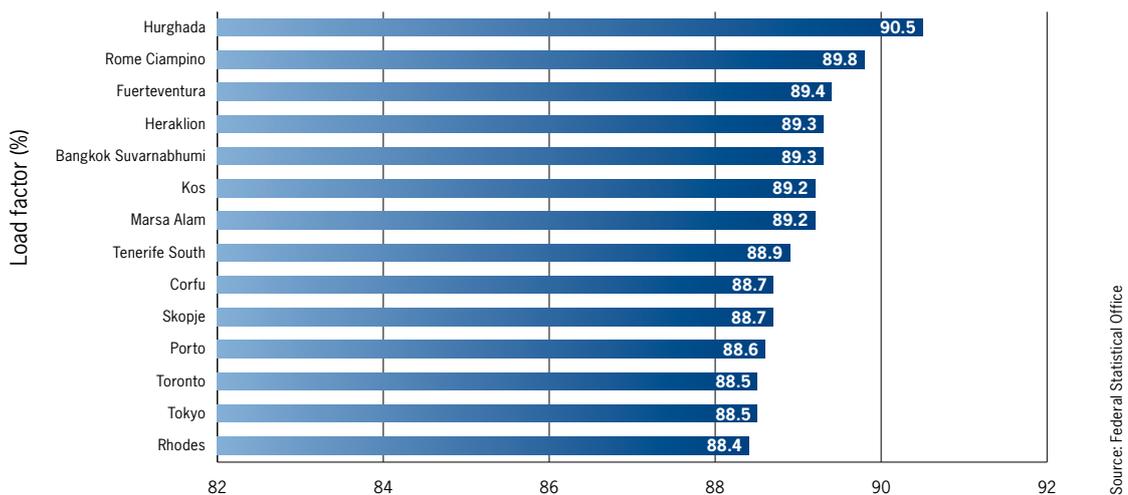
putting them in first place in Europe. Then come the Paris airports with an average of 1,053. Third place is taken by the two Istanbul airports (911 departures per day). Frankfurt Airport remains behind Amsterdam in fifth place.

Load factor



The extent to which seats are filled in the aircraft departing from and arriving at German airports has continued to increase. In 2017, 77.6 percent of all seats were occupied according to the German Federal Statistical Office.

Destinations with the best load factor



Flights to the tourist centres in Egypt, on the Canary Islands and Rome recorded the highest load factors in 2017. Overall, the load factor for flights abroad rose to 79.2 percent. These figures reflect flight destinations with over 1,000 flights per year.

Economic boom above the clouds: Air freight

Growth rates for freight more than doubled last year – a positive sign for the economy.



4.9
MILLION

tonnes of freight were handled at German airports in 2017.

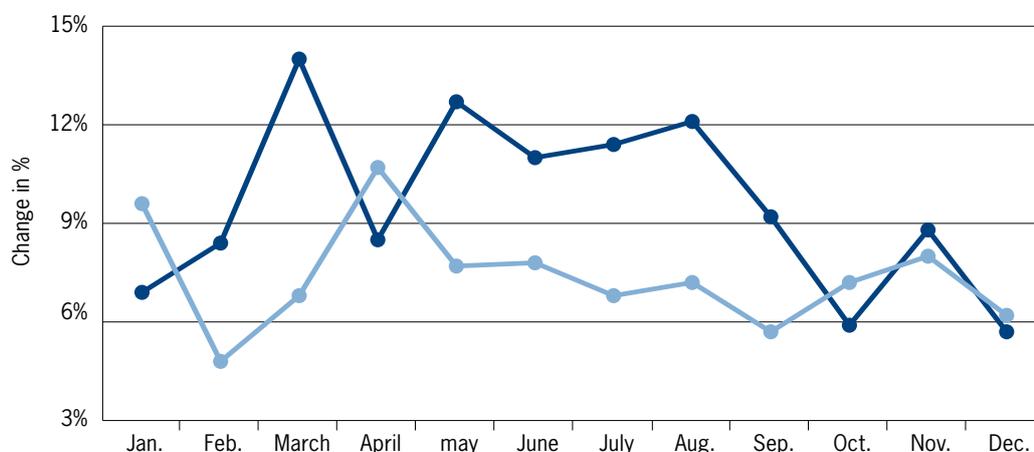
Around 60 million tonnes of freight were transported through the skies worldwide in 2017. According to IATA, nine percent more freight tonne kilometres were registered worldwide in 2017 compared with the previous year. The rise in freight was twice as high as in 2016 (+3.8 percent). This was the strongest growth in freight traffic since 2010.

In Europe, freight tonne kilometres rose by 11.8 percent. This shows that there was a recovery from the below-average growth seen in the region in 2016. Growth in the two largest

freight markets, North America (+7.8 percent) and Asia Pacific (+7.9 percent), remained slightly below average. The largest percentage growth (more than 25 percent) was recorded in Africa.

In 2017, 4.9 million tonnes of freight and post were handled at airports in Germany according to the German Federal Statistical Office. This is 6.2 percent more than in the previous year.

Freight and passenger traffic



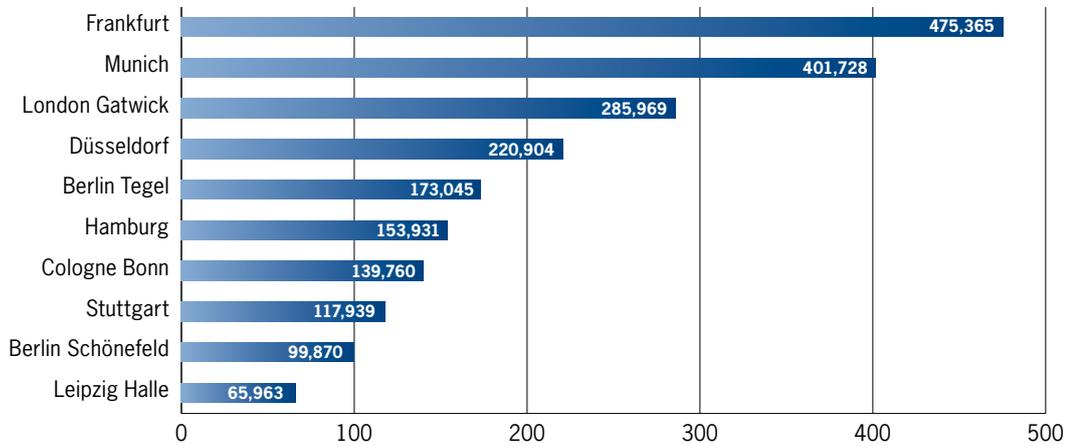
Source: IATA

Change in %	Passenger kilometres	Freight tonne kilometres
Africa	6.3	24.8
Asia Pacific	10.1	7.8
Europe	8.2	11.8
Latin America	7.0	5.7
Middle East	6.4	8.1
North America	4.2	7.9
Total	7.6	9.0

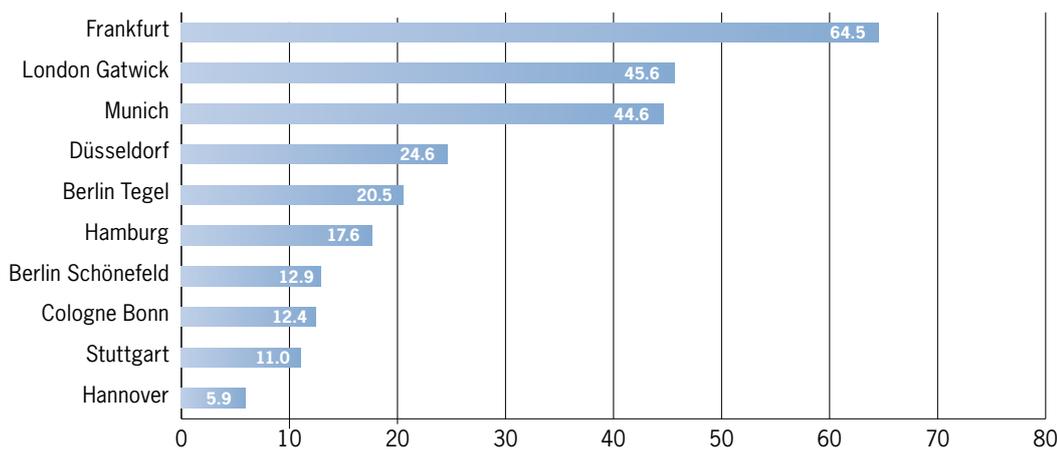
The volume of air freight in 2017 increased significantly in a year-on-year comparison. With a rise of nine percent, freight tonne kilometres – the volume of freight transported multiplied by the kilometres flown – grew more than twice as strong as in the previous year. Passenger volumes continued to grow at above-average rates, as was the case in the year before, with an increase of 7.6 percent.

The DFS Group and the largest airports where it operates

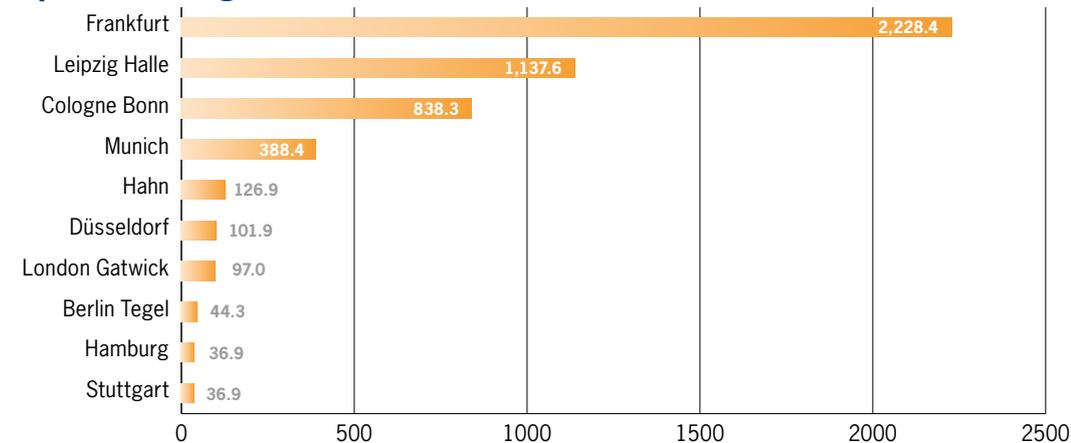
Top 10 for number of flights (IFR arrivals and departures)



Top 10 for number of passengers (millions)

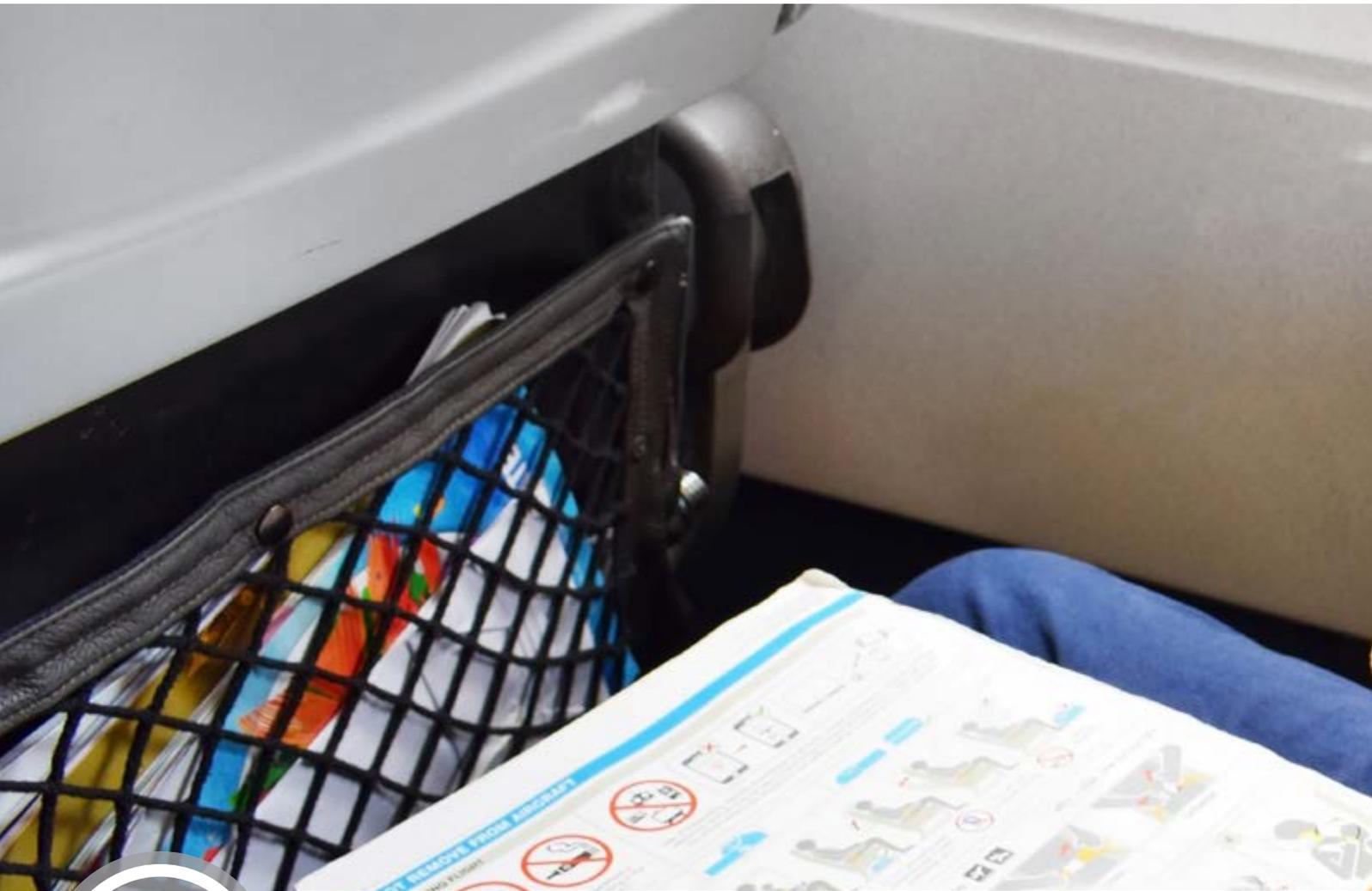


Top 10 for freight volume (thousands of tonnes)



Source: DFS, Federal Statistical Office

More than 475,000 flights, just under 65 million passengers and 2.23 million tonnes of freight were handled at Frankfurt Airport, the largest airport where the DFS Group operates. Through its British subsidiary, the DFS Group is responsible for providing air traffic control at London Gatwick. Edinburgh Airport in Scotland followed in 2018.



Safe and sound around the world: Air traffic safety statistics

Whoever boards an aeroplane can lean back and relax. According to IATA, the high level of aviation safety improved again.

Many people have an irrational relationship with flying. Only every third person feels at ease on board an aeroplane according to surveys. Two thirds feel a greater or lesser sense of unease. This feeling is completely misplaced. The figures from 2017 released by IATA again show that flying is an especially safe form of travel.

According to IATA, just under 42 million flights were conducted worldwide in 2017 – carrying more than four billion people. This corresponds to more than half the world's population. Around the world, IATA registered 45 air accidents with 19 deaths. The relationship between the numbers makes one thing clear: the probability of such an accident is minimal.



This is also demonstrated by the global accident rate released by IATA each year. This figure shows how many major accidents occur for every one million flights. According to IATA, a major accident means that the aircraft was damaged so badly that it is not worth repairing. For jet aircraft, the average accident rate worldwide declined to 0.11 in 2017. This is equivalent to only one major accident for every nine million flights. Compared with the five-year

rate, this was a clear improvement. Between 2012 and 2016, this average accident rate was 0.33 according to IATA.

Nevertheless, the same level of safety is not encountered all over the world. The lowest accident rates are for airlines from Asia, Europe and North America according to IATA. Based on the five-year rate, the highest rates are experienced in Africa.



Only after **9**
MILLION

accident-free flights are flown can you expect a major jet accident.

Keeping your distance in the air: Safety in German airspace



168

TIMES

This is the number of infringements of separation in 2017 where DFS played a contributing role. Of these, only 31 were safety-related.

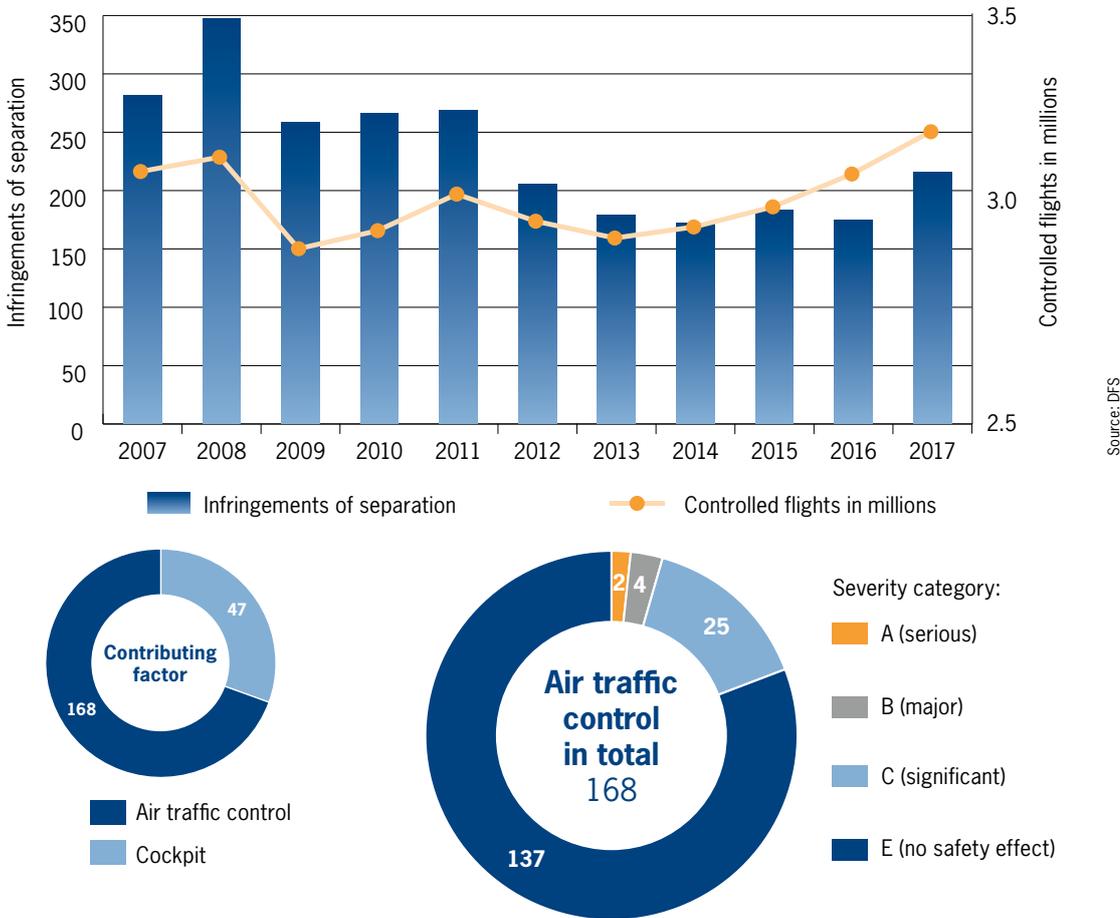
The safety level in German airspace remained as high as ever, even as the volume of traffic reached a record high. This is not only due to the hard work of air traffic control, the airlines and airports also play a vital part.

DFS has one special core task to perform to guarantee the safety of air traffic. It has to ensure sufficient distance, or separation, between aircraft in the air, and on the ground. Due to the high speeds flown, for safety reasons these distances are intentionally set high. In the air, the vertical separation is at least 1,000 feet (300 m) and the horizontal separation is three to five nautical miles (5.9 to 9.3 km) depending on the size of aircraft and phase of flight.

Any deviation from the prescribed separation minima is registered as an infringement of separation and is investigated. All infringements of separation are analysed and evaluated by the company's safety management division. There are four categories depending on the severity. They act as a type of early warning system for DFS. By thoroughly examining each individual deviation, potential risks become visible before they can have a negative impact on the safety of air traffic and DFS can take countermeasures.



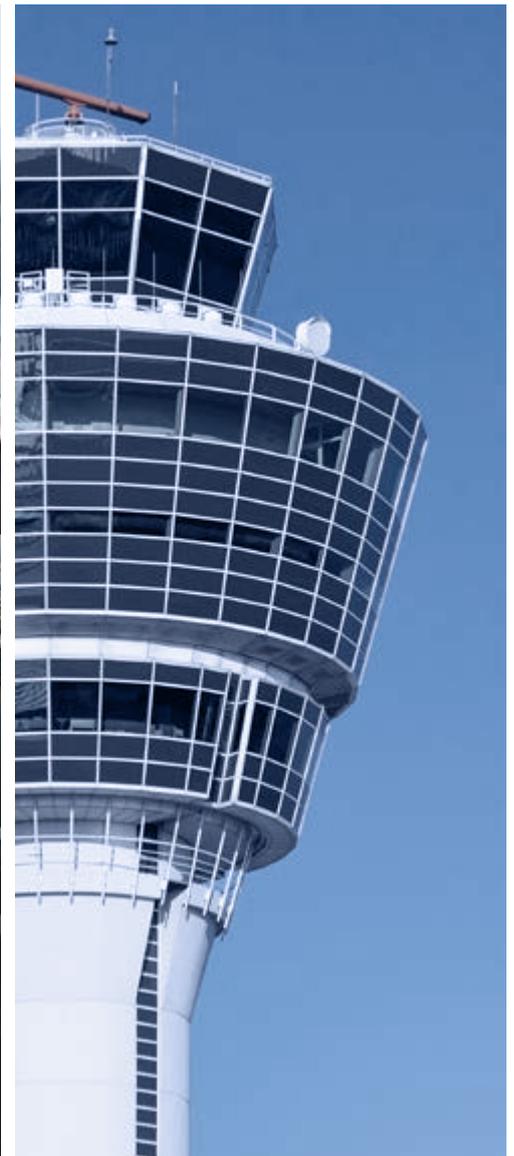
Infringements of separation



An infringement of separation occurs when the distance between two aircraft is less than prescribed. In 2017, 215 infringements of separation were documented in German airspace – DFS was involved in 168 of these. The Risk Analysis Tool (RAT) showed that the majority were not safety-related.

In its publications, DFS uses a method to evaluate infringements of separation that is applied uniformly across Europe. It is called the Risk Analysis Tool (RAT). This tool was introduced to harmonise safety classifications so that the safety levels of countries across Europe could be more accurately compared with each other. While DFS used to have a three-level system of severity, the RAT tool uses a four-level system. It differentiates between the categories: serious, major, significant and no safety effect. DFS has been using this new classification system since 2015. This means that the values prior to this new system are not comparable.

In 2017, 215 infringements of separation were recorded in German airspace for 3.2 million aircraft movements (2016: 174). DFS was a contributing factor in 168 of these (2016: 137). However, only a small percentage of these had an appreciable effect on safety. Of these 168 cases, 137 had no influence on safety at all. Twenty-five occurrences were classified as significant; four were categorised as major and two as serious. The number of infringements of separation in the top three severity levels remained more or less unchanged compared with the previous year (2016: two serious, eight major, twenty-one significant). This is an excellent level of performance given the continued rise in traffic volume.



80

PERCENT

of all runway incursions involved the cockpit crew as a contributing factor.

Keeping your distance on the ground: Safety at airports

DFS not only ensures safety in the skies above Germany. At the 16 international airports in Germany, DFS air traffic controllers also monitor all aircraft under their control while taxiing, taking off and landing.

Aircraft on the ground also need to keep their distance from each other to be safe. For this purpose, tower controllers monitor compliance with minimum distances that apply on the ground. Similar to infringements of separation in the air, it is the controllers' job to make sure these distances are maintained at all times.

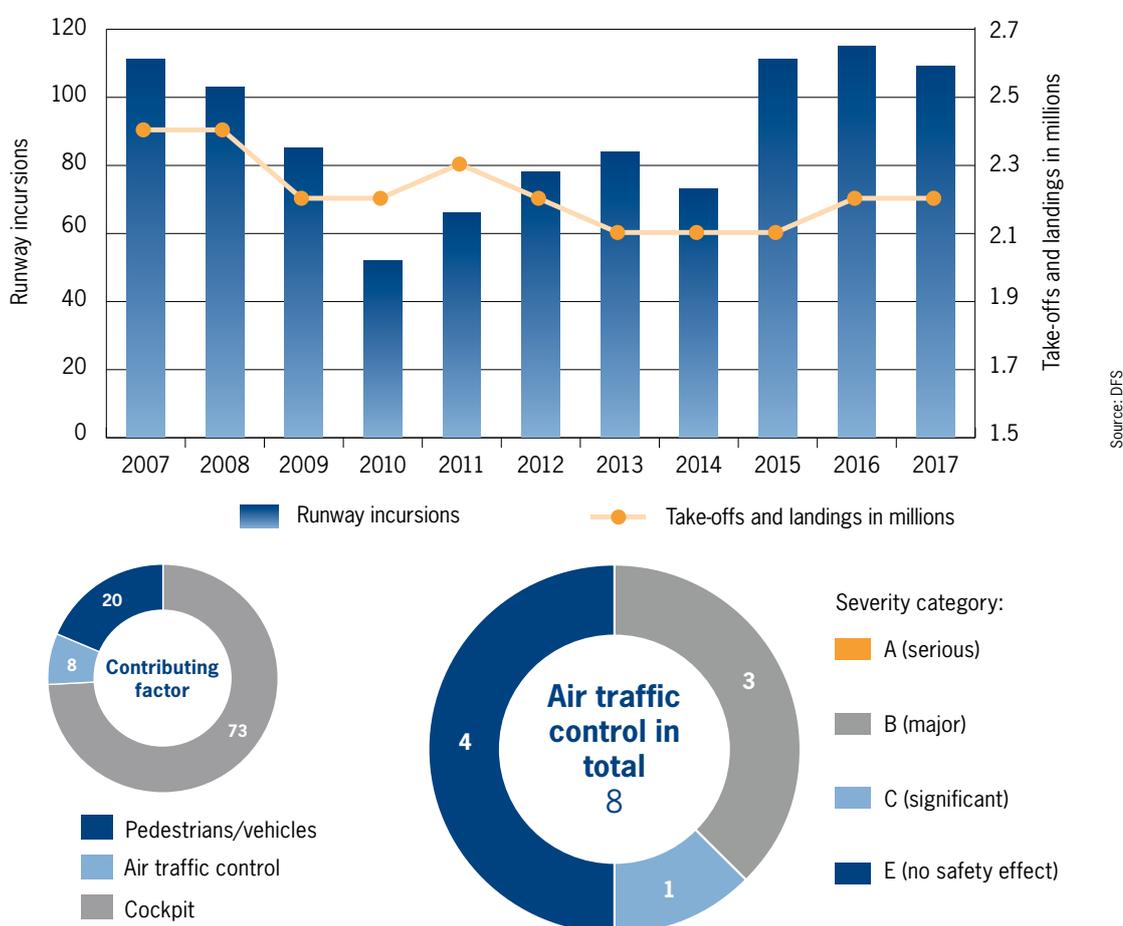
Whenever an aircraft takes off or lands, a protected area is activated in which no other aircraft, vehicle or person is allowed to enter. If this does happen, this is called a runway incursion.

As with infringements of separation, DFS records and analyses all runway incursions thoroughly regardless of whether the runway incursion actually posed a threat to safety or not. The new Risk Analysis Tool (RAT) in use across Europe is also used for this purpose. In 2017, 101 runway incursions were recorded out of around two million take-offs and landings at Germany's designated international airports (2016: 115).

traffic control was a contributing factor in only eight cases. Four of these were classified as safety-related. One was classified as significant and three as major. Not even one incident was categorised as serious. This means that safety on the ground improved compared with the previous year. Not only did the number of runway incursions overall decline. The number of incidents in the top three severity categories also went down compared with 2016.

In more than 70 of these cases, the cockpit crew contributed to the runway incursion. Air

Runway Incursions



On the ground, too, minimum distances need to be maintained: In the protected area of a surface designated for the take-off and landing of aircraft, the presence of other aircraft, vehicles or people is not allowed. If this does happen, this is called a runway incursion. Every runway incursion is recorded and analysed.

Of the 101 runway incursions that occurred at German airports in 2017, only eight involved DFS. The Risk Analysis Tool determined that three of these had to be categorised in the second highest severity category. There were no incidents in the highest category in 2017.

Rivals in the air: More safety for drone flights

More and more drones are filling the skies above Germany. These unmanned aerial vehicles are opening up new avenues of business across the whole economy – but they are posing a challenge for the safety of air traffic.

The exact number of drones in Germany is unknown. After all, there is no mandatory registration. Based on current sales volumes and industry reports, the number will soon reach the one-million mark. In 2017 alone, DFS estimates

that between 350,000 and 400,000 new drones entered circulation.

Every new drone increases the risk of collision between these small aircraft and manned aircraft. Last year, DFS recorded 88 cases



when civil air traffic was impeded by drones. This is about a third more than in the previous year (2016: 64 reports). This rise is, however, considerably lower than the rates of growth experienced in the past.

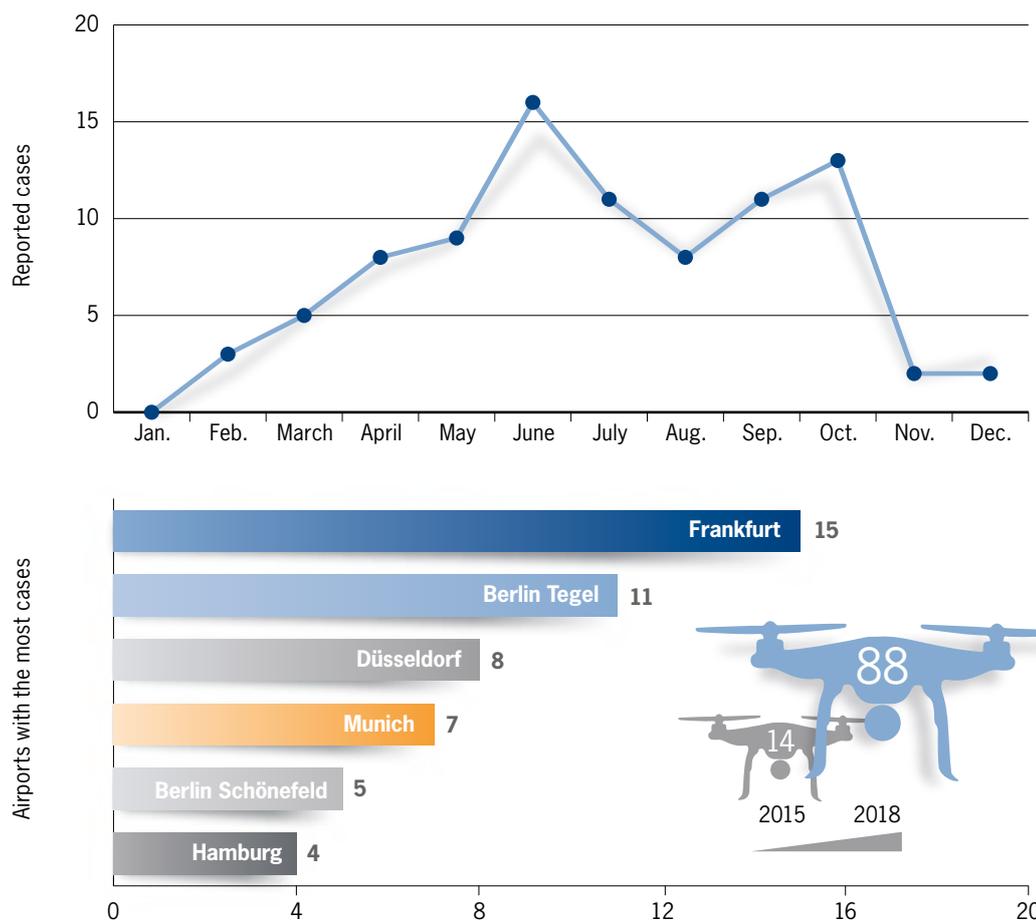
In 2017, DFS, together with the Belgian software company Unifly, developed an app to safely integrate these new airspace users into the skies above Germany. The app, which was launched in July 2017, shows amateur drone pilots where and when they are allowed to fly. It also informs users of the new regulations that were introduced in spring 2017 that need to be complied with by drone pilots in Germany. The

app can be downloaded to smartphones from the Apple App Store and the Google Play Store.

DFS has been working with partners since 2016 to locate and monitor drones using the mobile phone network. Unmanned aerial vehicles could then be operated beyond the remote pilot's line of sight. In addition, together with the German Federal Ministry of Transport, DFS has put together a comprehensive package of information for drone pilots on its website.

www.safe-droneflight.de
(This site is also available in English.)

Civil aircraft impeded by drones



An increasing number of drones goes hand in hand with an increasing number of cases in which unmanned aircraft systems come too close to regular air traffic. In 2017, DFS registered 88 such cases, which represents a clear levelling off of the rise seen in previous years.



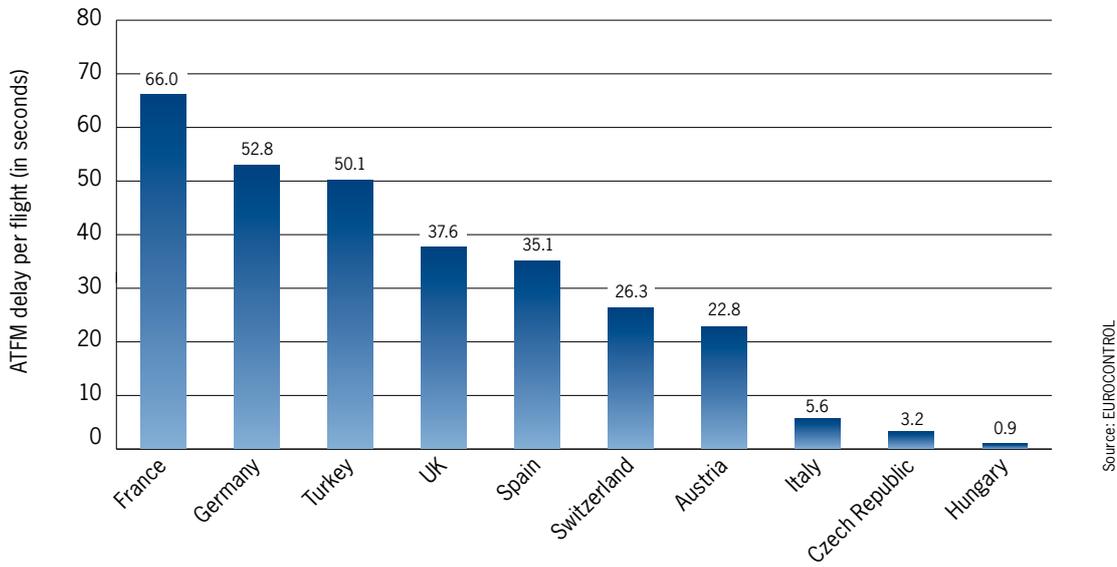
Take-offs and landings by the minute: Delays in air traffic

There can be many reasons for an aircraft taking off or landing late. For the most part, air traffic control plays only a small role.

The aviation system is complex – a complicated machine with many cogs that need to fit smoothly together. It only takes a late connecting flight, a shortage of gates or a thunderstorm to cause the system to snag. No other mode of transport is so dependent on the weather, for instance. Given all these factors, it is almost surprising that such a large number of flights reach their destinations on time. In 2017, around 80 percent of all flights in Europe arrived at their destinations without any major delay. A third of flights actually arrived ahead of time. Only one in six flights was more than 15 minutes late.

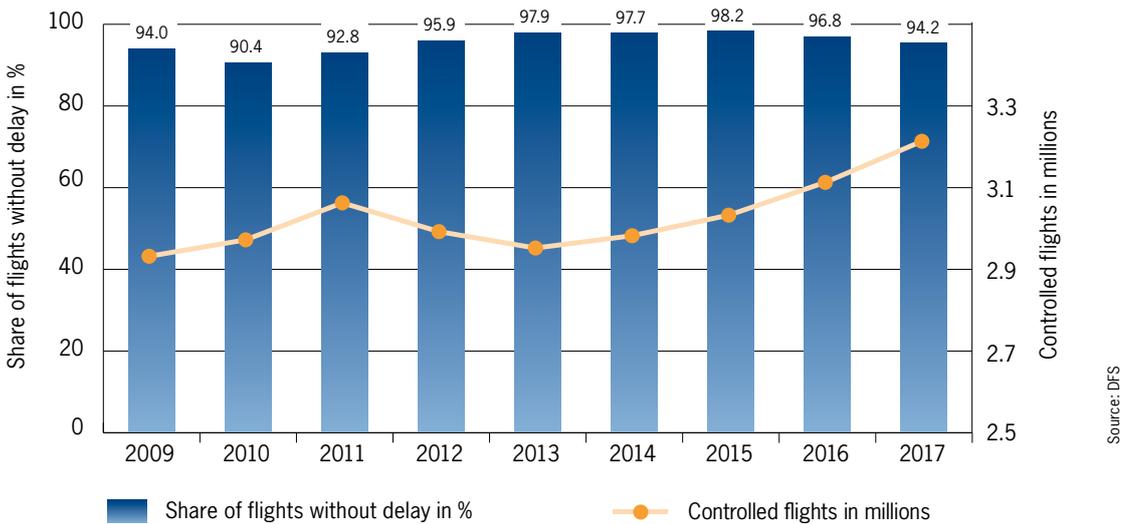
It is mostly the knock-on effects of prior delays that are the problem. These delays are often caused by the wait for passengers, baggage or new crew. An evaluation by the Central Office for Delay Analysis (CODA), a EUROCONTROL division, came to the conclusion that this reason lay behind half of all delays. CODA based this analysis on pilot reports. Their results show that every second delay is attributable to the airlines.

Punctuality in comparison



The average delay time caused by air traffic flow management (ATFM) was nearly 53 seconds per flight in German airspace. Only about half a minute of the delay was caused by air traffic control in 2017. The figure shows the punctuality in Europe's ten countries with the highest traffic volumes.

Traffic and punctuality



The percentage of delayed flights in German airspace is very small. In 2017, only 5.8 percent of flights were affected by air traffic flow management (ATFM) measures, for example due to bad weather, capacity bottlenecks at airports or high traffic volumes.



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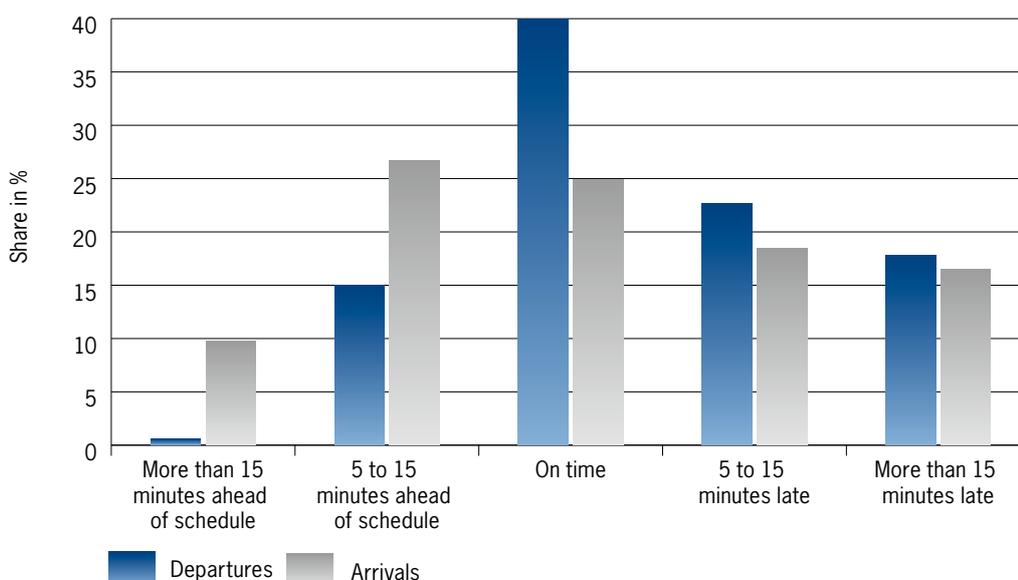
PERCENT

of all delays in Europe are caused by airlines.

Punctuality declined slightly in European airspace compared with the previous year. The average arrival delay in 2017 was 11.6 minutes (2016: 11 minutes). Bad weather and industrial action were the prime causes according to CODA. In addition, the aviation system is so tightly scheduled that it can be almost impossible to make up for delays once they sneak into the system. These then have a snowball effect on later flights.

The percentage of flights that were subject to air traffic flow management (ATFM) – due to factors such as capacity bottlenecks – increased as well. The average ATFM delay in German airspace in 2017 stood at just under 53 seconds. This is a very small proportion of the overall delay.

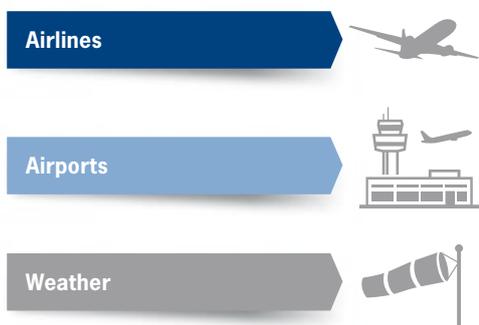
Punctuality in Europe



Source: EUROCONTROL/CODA

Every sixth aircraft in Europe takes off with more than 15 minutes of delay, for example due to ground handling delays or bad weather. By contrast, every third aircraft actually arrives earlier than scheduled.

Causes of delays – departures



Source: EUROCONTROL/CODA

Paris Charles-de-Gaulle	
Airlines	62%
Airports	11%
Weather	3%
Air navigation service providers	9%
Security	12%
Other	3%

Madrid Barajas	
Airlines	47%
Airports	22%
Weather	6%
Air navigation service providers	14%
Security	8%
Other	4%

London Heathrow	
Airlines	63%
Airports	18%
Weather	6%
Air navigation service providers	5%
Security	5%
Other	4%

Amsterdam	
Airlines	44%
Airports	33%
Weather	6%
Air navigation service providers	11%
Security	2%
Other	5%

Frankfurt	
Airlines	40%
Airports	24%
Weather	11%
Air navigation service providers	9%
Security	9%
Other	7%

Munich	
Airlines	54%
Airports	8%
Weather	12%
Air navigation service providers	9%
Security	10%
Other	7%



Saving fuel, reducing noise: Air traffic and environmental protection

Optimised flight routes save fuel, cause less harm to the environment and reduce noise disturbance for local residents. DFS endeavours to achieve the optimum result. This is by no means an easy task given the busy airspace over Germany.

DFS air traffic controllers guide the aircraft under their control to their destinations safely and punctually. They select the most direct route feasible to be as environmentally friendly as possible. This poses a difficult challenge in an airspace as busy as the one above Germany. With more than three million flight movements per year and up to 10,000 flights per day, it is simply impossible for every flight to reach its destination without deviating slightly from the

shortest route. Evaluations, however, show that DFS comes very close to providing the optimum flight path. The average route flown by aircraft in German airspace in 2017 was just 1.18 percent longer than the most direct route. This corresponds to a deviation of only 3.9 kilometres per flight. The immediate vicinity of airports has been left out of this assessment as, due to noise abatement, the shortest possible route can often not be used there.

DFS developed arrival profiles that are optimised vertically as a further measure to benefit the environment. In a joint effort with European partners and airlines, more than 30 approach procedures have been improved in this way at numerous airports. These include Basel, Berlin Tegel, Frankfurt, Geneva, Munich, Stuttgart, Strasbourg, Vienna and Zurich. By using improved procedures, aircraft remain at higher altitudes for longer. Optimal descent profiles have been designed for each aircraft type, allowing these aircraft to approach the airport with the lowest possible level of engine power.

There are other ways to reduce the noise level. DFS has introduced continuous descent operations (CDO) at all large airports where it operates. In contrast to conventional approach procedures, which contain phases in which the aircraft levels off, an aircraft using CDO glides at the same rate of descent until it lands. This uses less engine power, which reduces noise and lowers fuel consumption. CDO can only be used if certain conditions are met, however. The traffic volume has to be low, for instance.

DFS is always on the lookout for new ways to lessen the noise impact of flight operations for local residents. For example, a ground-based augmentation system (GBAS) has been installed at Frankfurt Airport. This enables satellite-based approaches at a steeper angle, reducing the noise for people who live below the approach paths. Aircraft, however, need to be equipped to use GBAS. Unfortunately, this is only the case for a small number of aircraft so far.

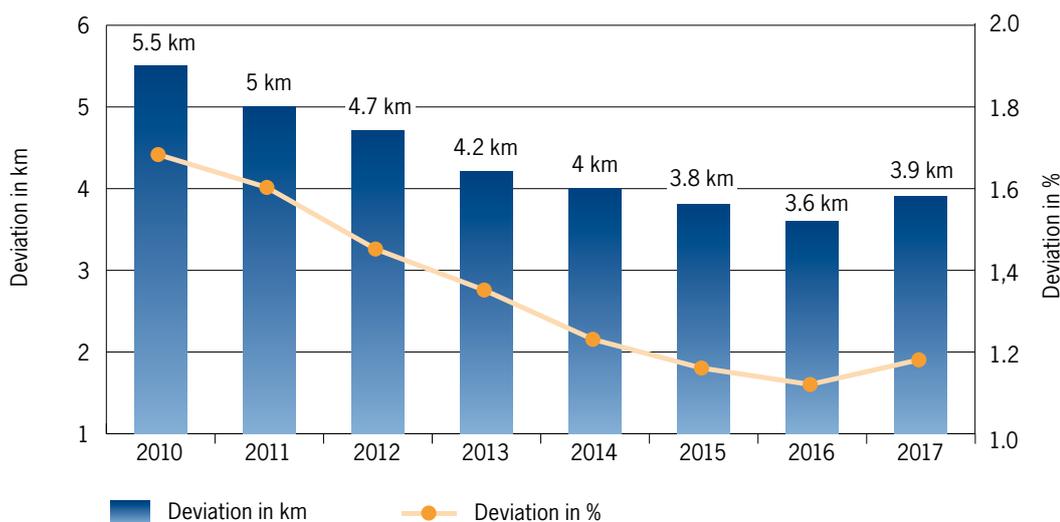
DFS is also putting its support behind a new website from the German Aviation Association (BDL). Online for only a few months, this website provides information on the strategies and measures in place to reduce emissions in aviation. Numerous projects at DFS can also be found, illustrated with up-to-date data and graphics.



1.18
PERCENT

is the average length of deviation from the shortest route.

En-route flight efficiency



The air traffic controllers at DFS guide the aircraft under their control to their destinations safely, punctually and by selecting the most direct route possible. The deviation between the route assigned and the most direct route amounted to only 1.18 percent in 2017, which corresponds to a detour of less than four kilometres.



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