



Indicator Information Sheet

Subject:	Air Transport Development
Kind of indicator:	Performance Indicator
Spatial objective:	Worldwide
Object:	Trends at Airlines
Theme:	Airline Fleet Development

1. Purpose of the indicator category

The purpose of the indicator field “Airline Fleet” is to give an overview on airline performance on a predefined time span with regard to the global fleet development. The monitoring of these parameters is in this context very important as airline fleet development is among the most relevant long-term strategic decisions for an airline, in terms of planning and operations. In addition, the global fleet composition reflects the state of technology for the whole air transport system with regard to traffic and environmental performance.

In the following, an airline’s fleet will be understood and described by the total number of aircraft that an airline operates at any given time, as well as by the specific aircraft types that comprise the total global fleet. Based on this definition, monitoring fleet size and composition from an airline’s perspective can furthermore be used to give hints on trends within the air transport market. The global fleet size and composition might indicate periods of recession or upturn. Preferable regions and extent of different areas that are covered by the long-term strategy of airlines are indicated by the corresponding aircraft types. As the following investigation only deals with the aggregated level “fleet composition”, merely the aircraft size level will be regarded while the view on individual aircraft types is excluded but already to a great extent covered by the market analyses of the aircraft manufacturers.

2. Description of the indicator development

In order to better understand airline fleet size and composition development projected on global operations, five indicators are proposed for the following analysis:

1. Aircraft in service per IATA airline

This indicator depicts a general picture about current IATA airline fleet usage and shows how the share of aircraft in service has developed over the years.

2. The share of stored aircraft compared to number of total aircraft

This indicator presents the ratio or share of stored aircraft compared to the total number of aircraft and gives hints at the condition of the air transport market by comparing the used capacity with the share of available capacity.

3. The number of aircraft orders per 100 aircraft in service

The development of the number of aircraft orders compared to a share of 100 aircraft in service allows looking at the future prospects of the air transport industry and the growth rates the airlines expect for the next years.

4. Share of aircraft size classes



The fourth indicator is devoted to show possible paradigm changes in the area of fleet composition over time, especially with regard to the size and function of the used aircraft.

5. Average age of aircraft

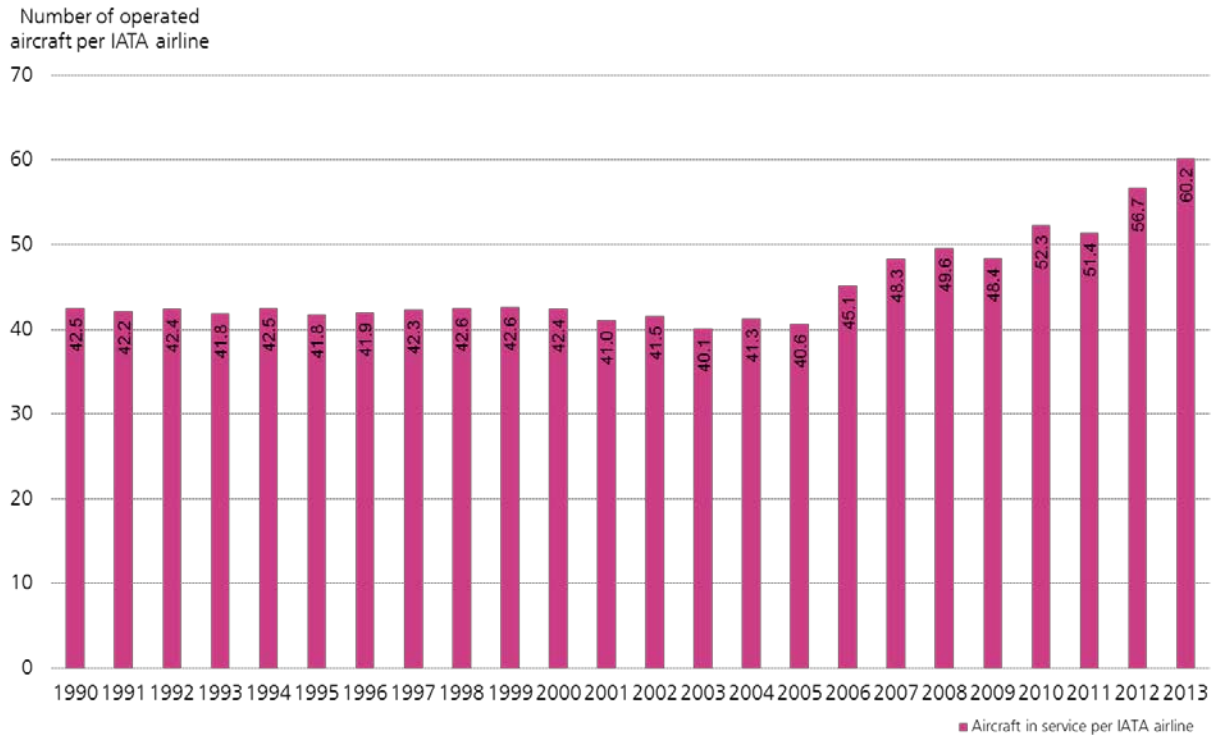
This indicator investigates possible changes with regard to the average age of aircraft over time, subdivided by a separate consideration of passenger and freighter aircraft.

More or less all indicator developments are in the following projected on a 20 year time period in order to provide a long-term view on the given subject.



Indicator 1: Aircraft in service per IATA airline

Source: DLR, own calculations based on IATA.



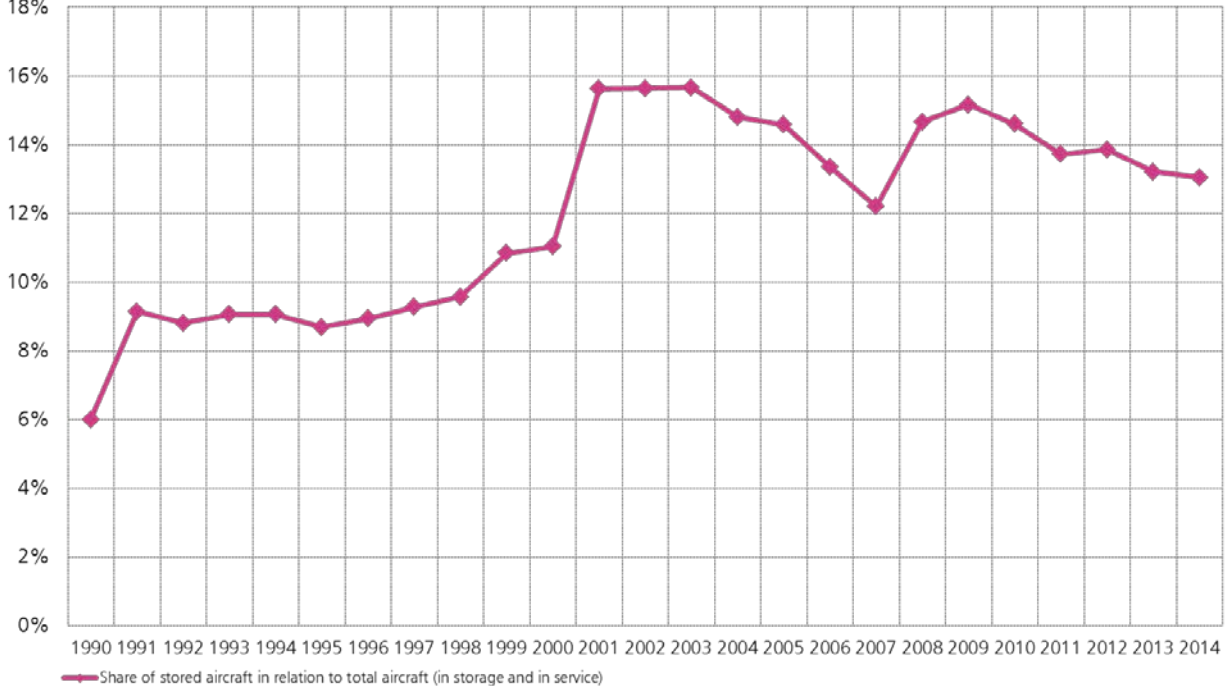
Indicator 1 shows briefly the number of aircraft in service per each IATA member airline with regard to the last 20 years. This figure is more or less constant between the years 1990 and 2005 by fluctuating around 42 aircraft per airline on average. For the first time this tendency is broken in the year 2006, when the years of high aviation growth started which is undermined within the picture by an all-time high around 50 aircraft per airline in 2008. The effects of the economic crisis become visible by slowing down the observed growth in 2009 with a small decline down to 48 aircraft. Since 2010 numbers reached an average above 50 aircraft per airline inclining to an all-time high in 2013 with 60 aircraft per airline.



Indicator 2: Share of stored aircraft compared to total number of aircraft

Source: DLR, own calculations based on ASCEND

Share of stored aircraft compared to total aircraft



The indicator on the share of stored aircraft compared to the total number of aircraft within the global fleet reflects the tendency observed in Indicator 1 on the development of the number of aircraft per IATA airline. After a strong increase of stored aircraft in 1991 from 6.0% in 1990 to 9.1% there can be recognized only a slight upward trend on the number of stored aircraft until 2000 (11.0%). In 2001, as a reaction on the attacks of 9/11, the share of stored aircraft has risen to 15.6 % before a continuous decrease is visible. As the economic crisis and the historical peak of the oil price in 2007 have effects on the demand for air transport services as well, the airlines started globally to cut back capacity between 2007 and 2009. Since then, the share went slightly down to 13.9% in 2012 and 13.0% in 2014 which corresponds to the capacity of aircraft in service as shown in Indicator 1.

The whole picture shows how vulnerable the whole air transport system is. Especially between the years 2001 and 2003, there is no movement in the trend curve visible as the number of stored aircraft stagnated on a historical peak by around 15.6%. Due to the attacks of 9/11 and the corresponding falling demand in 2001 and the economic crisis in 2009, the airlines were directly forced to cut capacity during this time span. The strong dependency of the airline industry on the development of framework conditions especially with regard to the political and economic dimensions is visible in these numbers. Small changes in this environment already lead to direct and fast reactions of airlines by taking capacity out of the market. On the other hand, boom years of air transport growth like it was the case between 2003 and 2007 can quickly result in an increase on the supply side in terms of aircraft in operation.



Indicator 3: Number of aircraft orders per 100 aircraft in service

Source: DLR, own calculations based on ASCEND

Share of aircraft orders in relation to aircraft in service (per unit of 100)



The graph above (Indicator 3) provides a general overview on the airline fleet development within the time period from 1990 to 2014 in terms of orders projected on 100 aircraft in service. A long-term horizon is in this case very important as aircraft orders are usually placed 3-4 years before airline fleet expansion is due. Back to the graph it can be noticed that in a 10 year period from 1990 to 2000 there is no significant increase in the percentage of aircraft orders identifiable. Namely after a gradual decrease a slight increase can be noticed from 1995-1998, before the share of orders returns to the previous value. Directly after 2001, this share decreases even more strongly – most probably due to the attacks of 9/11 which caused high insecurity in the air transport sector with regard to the future growth projections. Anyhow, the market recovered then very fast by increasing figures for aircraft orders until 2007 with a small decline in 2006. This corresponds to the boom years of aviation growth which are also expressed by Indicator 2.

This dependency on the external economic market is also identifiable in the following years by the vice versa tendency. When the economic crisis started in 2008/2009 the overall condition of the global markets directly influenced the investment decisions of airlines for the short-term as they reduced aircraft orders drastically between 2007 and 2009. This shows that strategic long-term decisions like fleet development are often influenced by short-term developments. Anyhow, for 2010 when the recovery of the markets already started and the support of governments for the economically affected industries showed first results, the stabilization of the whole situation is again in the airlines' investment decisions reflected by increasing orders to an all-time high in 2013, which only slightly went down in 2014, still being higher than the before all-time high in 2011. This marked increase may have been a result of a roll-out of new aircraft types like the A320neo or 737 MAX.

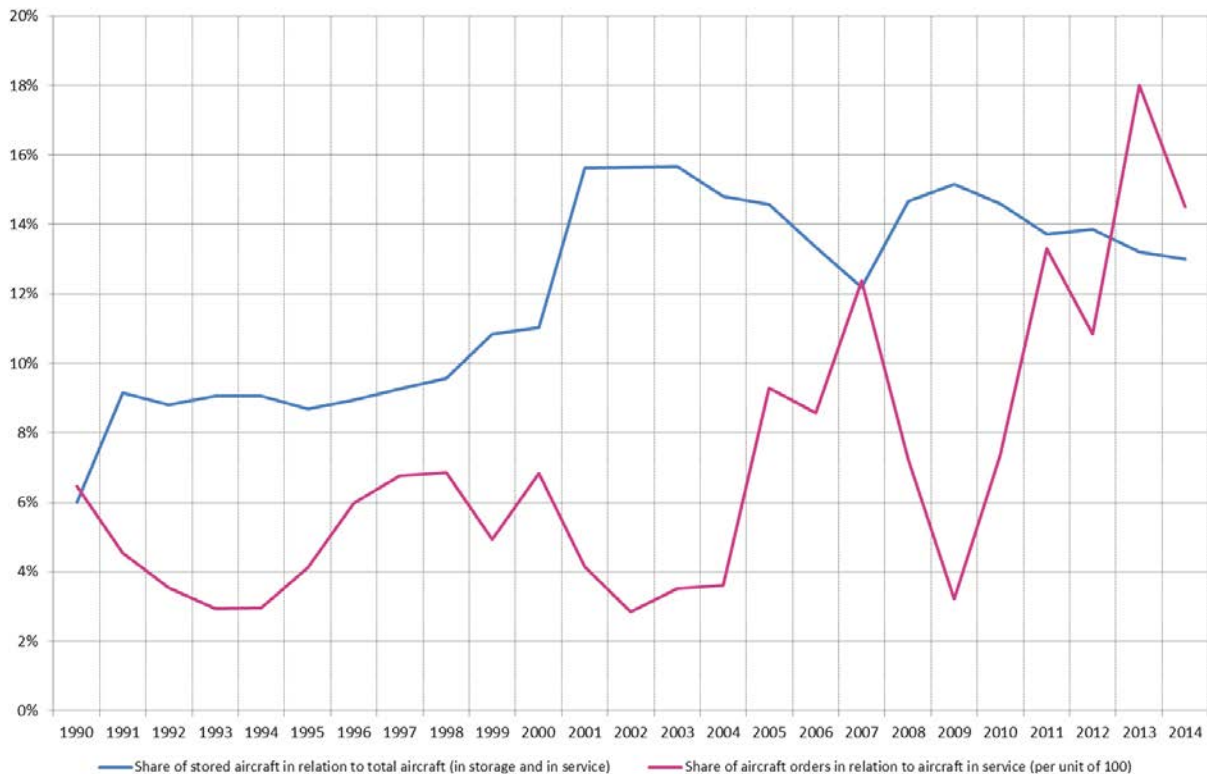


Anyhow, in order to understand the aircraft fleet development more profoundly, a correlation between the two previously mentioned indicators needs to be shown.

Besides similarities there is also a difference between the number of orders and the share of stored aircraft. In contrast to ups and downs in the orders, the percentage share of stored aircraft increases more or less continuously. The accumulated “extra orders” might have affected the significant increase in stored aircraft percentage in 2001. As orders stayed more or less steady until 2005 the number of stored aircraft has started to decrease. Despite radical increase in the number of orders between 2005 and 2008, there was significant decrease in the percentage of stored aircraft. These trends suggest that there was a favourable context for aviation between 2005 and 2008. As soon as recession started in 2008, the number of orders had then fallen again dramatically to the 1993 level and the ratio of stored aircraft has increased significantly. Recently, a more positive atmosphere has been developed and the number of orders increased again while the number of stored aircraft went down slightly. The share of aircraft orders reacts more intensely to outside influences than the share of stored aircraft. Nevertheless, an interrelation between orders and storage of aircraft is given in the last 20 years, as it is shown in the following graph.

Indicator 2 and 3: Number of aircraft orders compared to aircraft in storage

Source: DLR, own calculations based on ASCEND

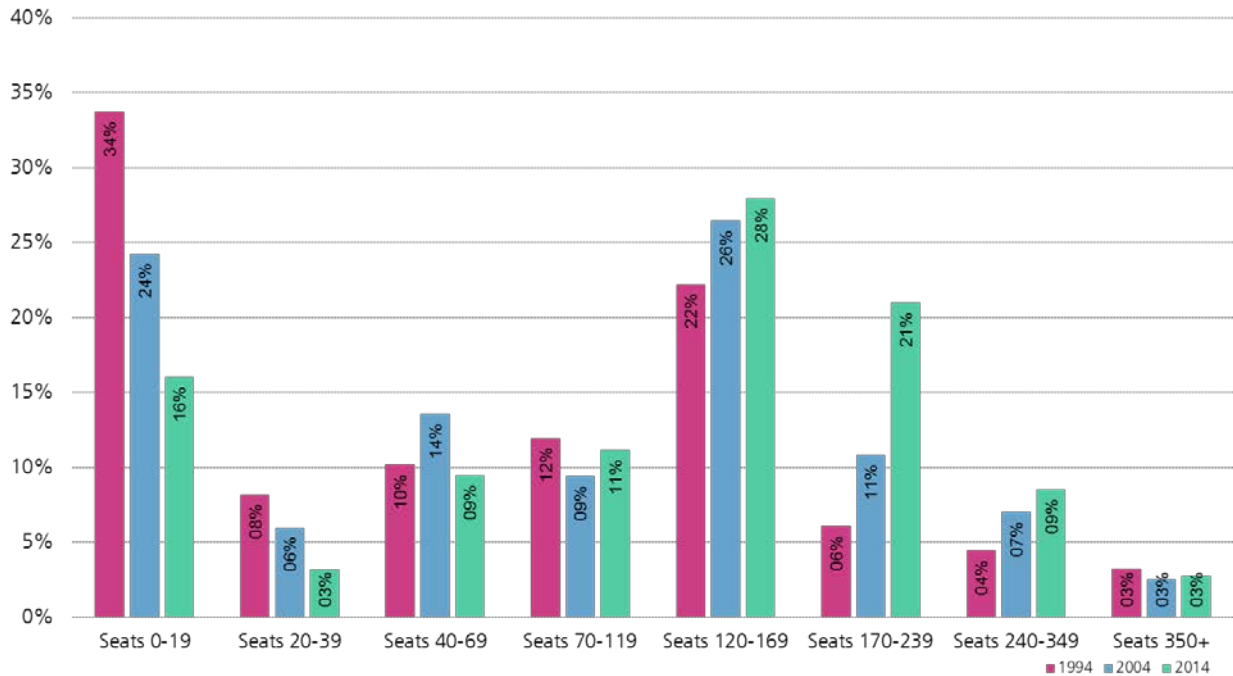




Indicator 4: Share of aircraft size classes

Source: DLR, own calculations based on ASCEND

Share of aircraft in different aircraft size classes

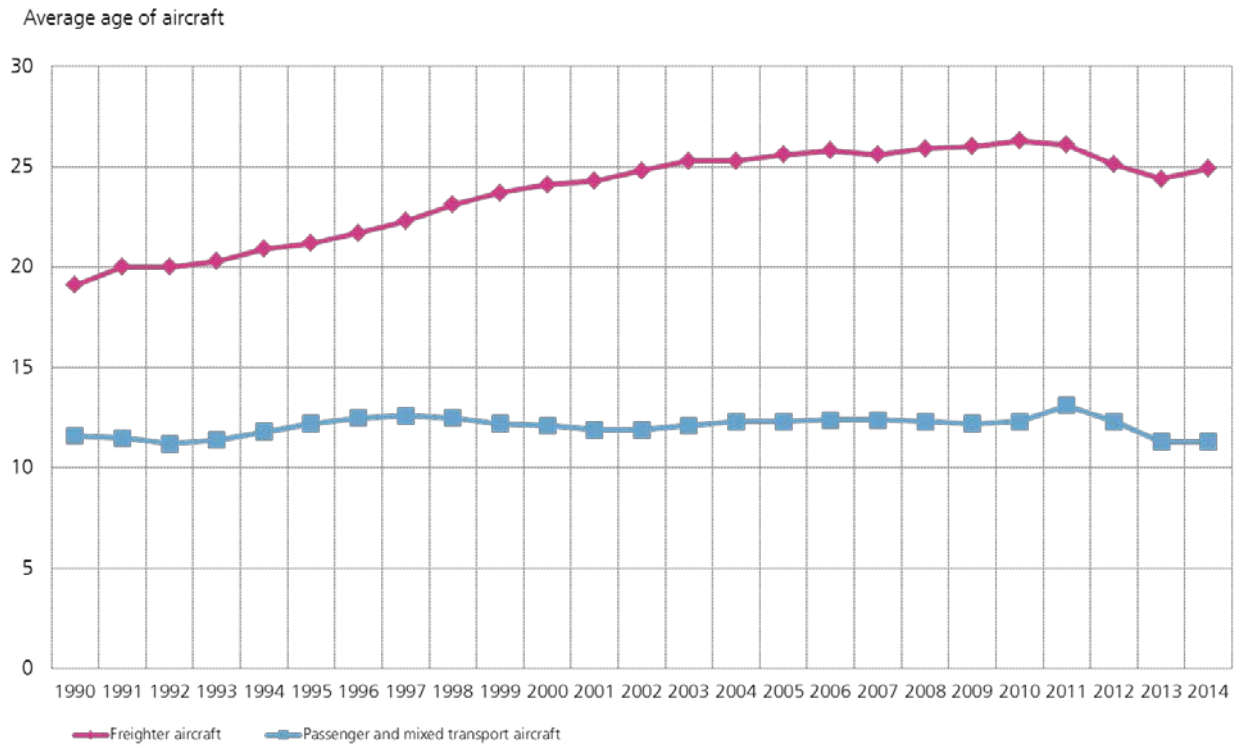


Indicator 4 shows in the graph above a clear paradigm shifting in aircraft size between the years 1994 and 2014. While in 1994 the aircraft with a size of 0-19 seats dominated the picture, this has changed for 2014 towards 120-169 seats aircraft (narrow body aircraft) with a share of 28.5% in the whole fleet. The reason for this development can clearly be seen in the business success of regional airlines and low cost carriers which emerged globally strongly during the regarded time period. Anyhow, there are also two other aircraft size groups that changed significantly over the past 20 years, namely the 170-239 and the 240-349 seats aircraft. Their share has almost doubled and tripled, respectively compared to the total number of aircraft in service. The main cause of the increase in the 170-239 seat category can be seen in the development of low cost carriers, which use single-aisle aircraft with a high seat density. But also aircraft in this seat category are popular among airlines for long-haul flights, despite the introduction of super jumbos and double deck aircraft that currently only have a small share in the entire global fleet. The remaining four groups of aircraft sizes only show slight variations with only a remarkable decrease of aircraft with 20-39 seats.



Indicator 5: Average age of aircraft

Source: DLR, own calculations based on ASCEND



Indicator 5 describes very well differences in aircraft fleet development strategies concerning aircraft dedicated to passenger and mixed transport on the one hand, and aircraft used for freight transport on the other hand. As the graph shows, the average age of freighter aircraft grew continuously to 26 years on average within the last decades with a visible reduction only in the years 2012 to 2013. In 2014 the average age of freighter went up to 24.9 years again. In contrast, the average age of passenger and mixed transport aircraft rose only slightly from 11.6 years to 13.1 years from 1990 to 2011. Since then, the average even went down to 11.3 years in 2014. These differences can plausibly be explained by the fact that airlines use passenger aircraft more intensively than cargo aircraft, therefore newer and more fuel efficient aircraft are being introduced. So, there is a strong motivation especially for the renewal of the passenger aircraft fleet especially from the cost side. In addition, the evolution of the market by low cost carriers, which started in the last two decades, surely contributed additionally to a younger passenger aircraft fleet. The strategy of such carriers includes holding the newest and most efficient aircraft in order to be competitive with low operational costs what allows to generate higher revenues.



Finally, it can be concluded that all presented indicators describe quite well key measures or events that were introduced or occurred in the area of airline fleets as well as trends in fleet development strategies. As decrease or increase in the size of airline fleet and the composition of the fleet are directly linked to the development of air traffic and reflect if air transport is in a good or bad shape, a correct interpretation of the shown graphs could contribute to a forecast of the development of the air transport sector in the future. Nevertheless, the given indicator set already fulfills an important task with regard to the status quo analysis of the air transport system by presenting main trends and challenges of the last 20 years and making the airlines' reactions on this more transparent.

3. Main sources of the discussed indicators

- IATA: World Air Transport Statistics ([Metadata description](#))
- Ascend: Online Fleets Database ([Metadata description](#))

4. Alternative sources to build similar indicators in the given indicator field

- ATI Database
- JP Data Airlines Database
- Airline Business

This Indicator Information Sheet was prepared by the MONITOR project partners Slot Consulting and DLR – Institute of Air Transport and Airport Research.

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**Indicator 1: Aircraft in service per IATA airline**

Year	Aircraft in service	No. of IATA member airlines	Aircraft in service per IATA airline
1990	8,588	202	42.5
1991	8,687	206	42.2
1992	9,032	213	42.4
1993	9,279	222	41.8
1994	9,657	227	42.5
1995	9,853	236	41.8
1996	10,478	250	41.9
1997	10,993	260	42.3
1998	11,150	262	42.6
1999	11,376	267	42.6
2000	11,666	275	42.4
2001	11,200	273	41.0
2002	11,338	273	41.5
2003	10,822	270	40.1
2004	10,904	264	41.3
2005	10,584	261	40.6
2006	11,231	249	45.1
2007	11,397	236	48.3
2008	11,153	225	49.6
2009	11,235	232	48.4
2010	12,289	235	52.3
2011	12,327	240	51.4
2012	13,715	242	56.7
2013	14,445	240	60.2

Values for Membership, Operating Fleet and Employees considered at 31 December.

Source: All values after 2009 belong to the newest IATA WATS Edition available. Values from 2000-2009 belong to the IATA WATS 54th Edition (2010). All other values belong to the IATA WATS editions of the previous years. The number of IATA members for 2013 was not given in the IATA WATS edition of 2014. Therefore, it was retrieved from the IATA Annual Review 2013.



Indicator 2: Share of stored aircraft compared to total number of aircraft

Year	Total aircraft in storage	Total aircraft in service	Sum: Total aircraft in storage and total aircraft in service	Share of stored aircraft in relation to total aircraft (in storage and in service)
1990	1,143	17,903	19,046	6.0%
1991	1,839	18,269	20,108	9.1%
1992	1,829	18,923	20,752	8.8%
1993	1,945	19,532	21,477	9.1%
1994	1,988	19,943	21,931	9.1%
1995	1,944	20,423	22,367	8.7%
1996	2,033	20,708	22,741	8.9%
1997	2,137	20,899	23,036	9.3%
1998	2,261	21,352	23,613	9.6%
1999	2,638	21,700	24,338	10.8%
2000	2,762	22,261	25,023	11.0%
2001	4,023	21,712	25,735	15.6%
2002	4,085	22,042	26,127	15.6%
2003	4,155	22,368	26,523	15.7%
2004	3,985	22,920	26,905	14.8%
2005	3,958	23,190	27,148	14.6%
2006	3,668	23,796	27,464	13.4%
2007	3,409	24,532	27,941	12.2%
2008	4,137	24,078	28,215	14.7%
2009	4,345	24,310	28,655	15.2%
2010	4,264	24,937	29,201	14.6%
2011	3,942	24,787	28,729	13.7%
2012	4,085	25,393	29,478	13.9%
2013	3,966	26,062	30,028	13.2%
2014	4,044	26,959	31,003	13.0%

Source: ASCEND Online Fleets Database. Data covers all aircraft for the usage of passenger transport, cargo transport and mixed transport (passenger + cargo); inclusion of jets and turboprops

**Indicator 3: Number of aircraft orders per 100 aircraft in service**

Year	Total aircraft orders	Total aircraft in service	Share of aircraft orders in relation to aircraft in service (per unit of 100)
1990	1,156	17,903	6.5%
1991	829	18,269	4.5%
1992	670	18,923	3.5%
1993	576	19,532	2.9%
1994	589	19,943	3.0%
1995	842	20,423	4.1%
1996	1,239	20,708	6.0%
1997	1,416	20,899	6.8%
1998	1,466	21,352	6.9%
1999	1,069	21,700	4.9%
2000	1,522	22,261	6.8%
2001	898	21,712	4.1%
2002	627	22,042	2.8%
2003	786	22,368	3.5%
2004	827	22,920	3.6%
2005	2,154	23,190	9.3%
2006	2,039	23,796	8.6%
2007	3,035	24,532	12.4%
2008	1,740	24,078	7.2%
2009	783	24,310	3.2%
2010	1,829	24,937	7.3%
2011	3,298	24,787	13.3%
2012	2,756	25,393	10.9%
2013	4,696	26,062	18.0%
2014	3,921	26,959	14.5%

Source: ASCEND Online Fleets Database: Data covers all aircraft for the usage of passenger transport, cargo transport and mixed transport (passenger + cargo); inclusion of jets and turboprops



Indicator 4: Share of aircraft size classes - absolute figures

Year	Seats 0-19	Seats 20-39	Seats 40-69	Seats 70-119	Seats 120-169	Seats 170-239	Seats 240-349	Seats 350+	Total aircraft in service
1990	6,400	1,399	1,907	2,193	3,531	712	709	562	17,413
1991	6,279	1,454	1,931	2,202	3,777	811	761	582	17,797
1992	6,448	1,513	1,943	2,168	4,114	1,002	798	594	18,580
1993	6,607	1,566	1,968	2,251	4,255	1,109	835	611	19,202
1994	6,626	1,605	1,999	2,346	4,366	1,193	868	637	19,640
1995	6,641	1,665	2,061	2,438	4,487	1,277	935	659	20,163
1996	6,615	1,728	2,096	2,444	4,597	1,329	1,004	669	20,482
1997	6,564	1,711	2,070	2,449	4,724	1,413	1,096	685	20,712
1998	6,488	1,706	2,142	2,405	5,025	1,526	1,205	685	21,182
1999	6,383	1,707	2,245	2,272	5,266	1,705	1,303	657	21,538
2000	6,261	1,718	2,397	2,285	5,515	1,884	1,398	645	22,103
2001	5,876	1,661	2,496	2,093	5,439	1,993	1,411	599	21,568
2002	5,656	1,571	2,678	2,084	5,646	2,202	1,477	587	21,901
2003	5,629	1,476	2,890	2,070	5,789	2,286	1,512	574	22,226
2004	5,526	1,363	3,091	2,143	6,029	2,469	1,598	574	22,793
2005	5,427	1,282	3,096	2,238	6,189	2,608	1,651	578	23,069
2006	5,347	1,318	3,118	2,304	6,481	2,797	1,732	581	23,678
2007	5,190	1,310	3,133	2,479	6,813	3,065	1,842	589	24,421
2008	4,831	1,177	3,046	2,564	6,723	3,165	1,879	591	23,976
2009	4,620	1,113	2,973	2,697	6,821	3,503	1,886	598	24,211
2010	4,626	1,064	2,938	2,748	7,089	3,810	1,988	581	24,844
2011	4,438	993	2,987	2,752	7,227	4,220	2,031	588	25,236
2012	4,475	957	2,817	2,848	7,294	4,662	2,097	619	25,769
2013	4,226	884	2,640	2,806	7,307	5,100	2,169	667	25,799
2014	4,276	852	2,520	2,979	7,462	5,603	2,273	726	26,691

Source: ASCEND Online Fleets Database: Data covers all aircraft in service for the usage of passenger transport, cargo transport and mixed transport (passenger + cargo); inclusion of jets and turboprops

**Indicator 5: Average age of aircraft**

Year	Passenger and mixed transport aircraft	
	aircraft	Freighter aircraft
1990	11.6	19.1
1991	11.5	20.0
1992	11.2	20.0
1993	11.4	20.3
1994	11.8	20.9
1995	12.2	21.2
1996	12.5	21.7
1997	12.6	22.3
1998	12.5	23.1
1999	12.2	23.7
2000	12.1	24.1
2001	11.9	24.3
2002	11.9	24.8
2003	12.1	25.3
2004	12.3	25.3
2005	12.3	25.6
2006	12.4	25.8
2007	12.4	25.6
2008	12.3	25.9
2009	12.2	26.0
2010	12.3	26.3
2011	13.1	26.1
2012	12.3	25.1
2013	11.3	24.4
2014	11.3	24.9

Source: ASCEND Online Fleets Database: Data covers all aircraft in service for the usage of passenger transport, cargo transport and mixed transport (passenger + cargo); inclusion of jets and turboprops

**Indicator 2/3: Share of stored aircraft compared to total number of aircraft and Number of aircraft orders per 100 aircraft in service**

Year	Share of stored aircraft in relation to total aircraft (in storage and in service)	Share of aircraft orders in relation to aircraft in service (per unit of 100)
1990	6.0%	6.5%
1991	9.1%	4.5%
1992	8.8%	3.5%
1993	9.1%	2.9%
1994	9.1%	3.0%
1995	8.7%	4.1%
1996	8.9%	6.0%
1997	9.3%	6.8%
1998	9.6%	6.9%
1999	10.8%	4.9%
2000	11.0%	6.8%
2001	15.6%	4.1%
2002	15.6%	2.8%
2003	15.7%	3.5%
2004	14.8%	3.6%
2005	14.6%	9.3%
2006	13.4%	8.6%
2007	12.2%	12.4%
2008	14.7%	7.2%
2009	15.2%	3.2%
2010	14.6%	7.3%
2011	13.7%	13.3%
2012	13.9%	10.9%
2013	13.2%	18.0%
2014	13.0%	14.5%

Source: ASCEND Online Fleets Database: Data covers all aircraft for the usage of passenger transport, cargo transport and mixed transport (passenger + cargo); inclusion of jets and turboprops