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## **Air transport in Africa**

A portrait of capacity and competition in various market segments

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**Abstract:** Sub-Saharan Africa's air transport, though low in overall volume when compared to other regions in the world, has experienced significant growth in the last decade, both in international and domestic traffic. The sector, in part because of its relatively small size, still faces the challenges of high concentration in services and lack of competition, with only a few dominant airlines providing international services within the continent. In addition, Africa faces challenges in safety oversight, as well as having many smaller non-viable state-owned carriers.

**Keywords:** Africa air transport, Herfindahl-Hirschmann, aviation safety, competition

**JEL classification:** R40, R41, D40, D43

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## 1 Contextual setting of air transport in Africa

Air transport in Africa is a vigorously growing sector. However, the growth, though an important element of the sector, does not provide a complete perspective of its health. Several important facts play a role in truly understanding where Africa's air transport has been, is now, and where it might develop.

Air transport volumes in Africa are still very low when compared to the rest of the world. The density of traffic, measured in seat capacity, is relatively small: with 104 million seats, on all types of routes, sub-Saharan Africa is far behind the country of Brazil, with 120 million seats, of which nearly 100 million are domestic traffic only. Other comparisons are as staggering. In the area of Washington, DC in the US, three airports (Reagan National Airport, Duller Airport, and Baltimore Washington International Airport) had 68.5 million passengers in 2015, which would translate to 90 million seats at a load factor of 76 per cent. This is nearly all of the capacity offered in all of sub-Saharan Africa. A simple snapshot of current aircraft positions in flight throughout the world shows the sparsity of service in Africa (Figure 1).

The distribution of these capacities is also important: the main air transport corridors are along the East (Figure 2), stretching from South Africa to Kenya and north to Ethiopia, all three being important hubs. No such hubs exist in West Africa, and Central Africa has minimum service.

Another factor is the fact that Africa still leads in hull losses due to accidents,<sup>1</sup> and still retains a safety record that is in most need of improvement when compared to the rest of the world. Though there has been significant improvement from 2010 until 2013, the sharp increase since then (in 2015 at 3.49) is well ahead of the Commonwealth of Independent States (1.88), and much above of the world average (0.32) (Figure 3).

The industry is also having difficulty in adopting more modern approaches to airline ownership and management. The notion of the national flag carrier is still deeply ingrained in the politics of the air transport sector, and though various privatization attempts have been made (e.g. PPP arrangements for Air Senegal after the disbandment of Senegal Airways), many governments are reluctant to (a) completely hand over airlines to the private sector, or (b) completely depend on airlines from the outside if a national airline is not economically sustainable. The air transport sector generally is seen as a way to show technical accomplishment and skill, which motivates many governments to pursue policies that in the end are not economically sustainable.

Both anecdotally and empirically the new challenges for African air transport market development are not so much around liberalization, but rather affordability and the rise of airport charges. Though lack of liberalization has been an issue, the implementation of the Yamoussoukro Decision for introducing liberalization amongst African countries is taking place, as evidenced, for example, by the expansion of fifth freedom routes of Ethiopian Airlines.<sup>2</sup> However, new and

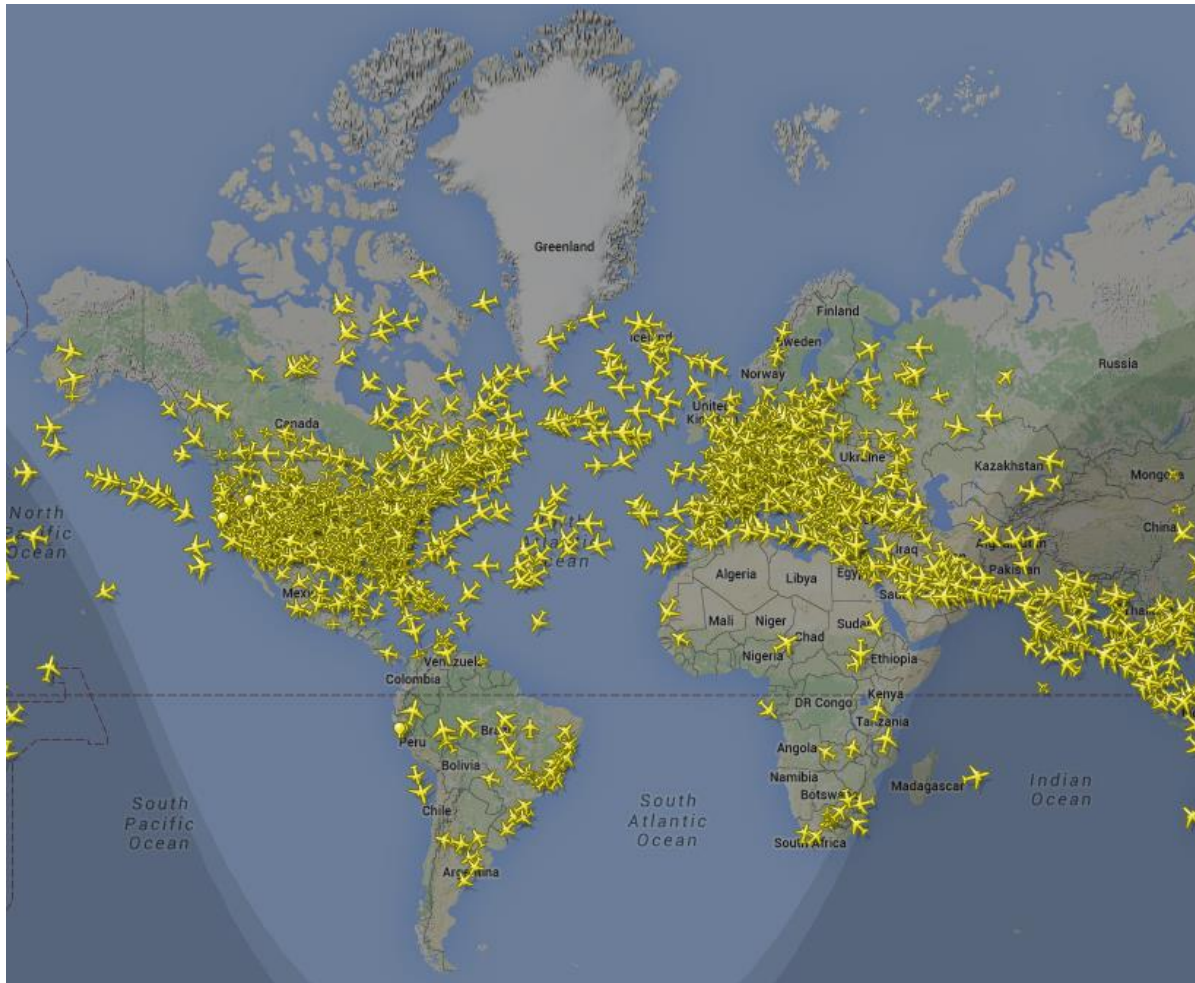
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<sup>1</sup> Hull losses are only one measure of accident rates, and can be skewed: the newer the airplane, the less likely the airplane is to be written off after an accident rather than repaired. This means, however, that higher hull loss rates may also indicate older aircraft being in service.

<sup>2</sup> For an explanations of the freedoms of the air, see Appendix 1.

sometimes overambitious investments in airports and terminal buildings are increasingly being financed by higher per passenger airport charges.

Figure 1: Global aircraft positions over continents and oceans, 9 July 2016



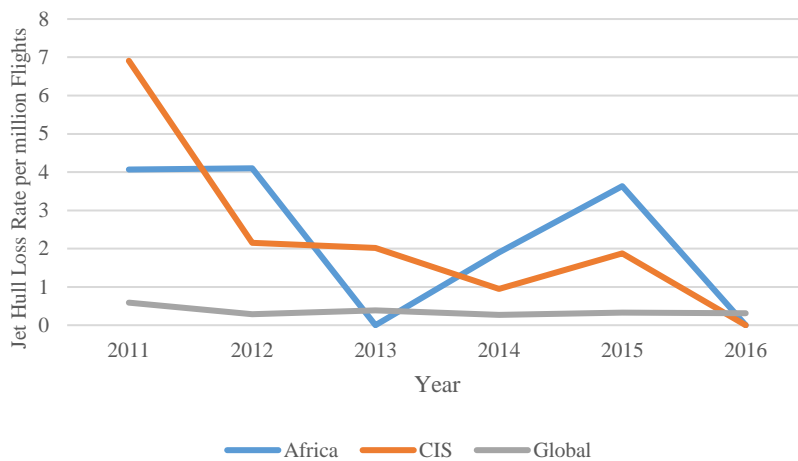
Source: flightradar24.com (2016), captured 9 July 2016 at 11:25 a.m. EST, reproduced with permission.

Figure 2: Global aircraft positions over continental Africa, 9 July 2016



Source: flightradar24.com (2016), captured 9 July 2016 at 11:28 a.m. EST, reproduced with permission.

Figure 3: Jet hull loss rate per 1 million flights, 2010–15.



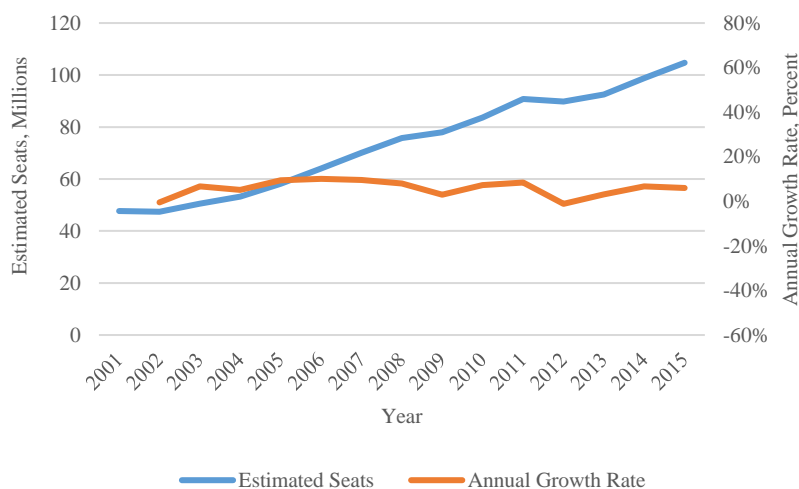
Source: Author's chart based on IATA (2016).

## 2 Airlines and routes

### 2.1 Overview of traffic and intercontinental capacities

The overall air transport capacity in sub-Saharan Africa has seen *significant* growth starting in 2002, from 47.6 million seats to 104.7 million seats in 2015 (Figure 4). Overall, traffic grew at an annual rate of 5.8 per cent between 2001 and 2015, and between 2003 and 2010 the rate jumped to 7.6 per cent. The years of global economic downturn, between 2009 and 2012, showed a growth rate of 4.9 per cent, followed by a rate of 5.3 per cent during the subsequent recovery.

Figure 4: Estimated seats for scheduled air transport in Africa, 2001–15



Note: The growth has been significant.

Source: Author's calculations based on data by diio (2016).

Route types in the African market can be divided into different segments: intercontinental traffic, international traffic within sub-Saharan Africa, international traffic between North Africa and sub-

Saharan Africa, and domestic traffic within sub-Saharan Africa (Table 1 and Figure 6). The highest amount of capacity can be found in the intercontinental capacities, followed very closely by domestic seat capacity. Though a small player in overall capacity, the routes connecting North Africa with sub-Saharan Africa show the highest growth rates, at 12.0 per cent (Figure 5). The growth in routes with North Africa may have to do with hubs in North Africa providing connections for travellers from underserved Sub-Saharan countries, especially in West Africa.

Recent developments include first the rise of Ethiopian Airlines' role on the continent, displacing South African Airways as the leader. Both Ethiopian and Emirates seemed to have appeared rather rapidly, without much of a share in 2001 (Table 2).

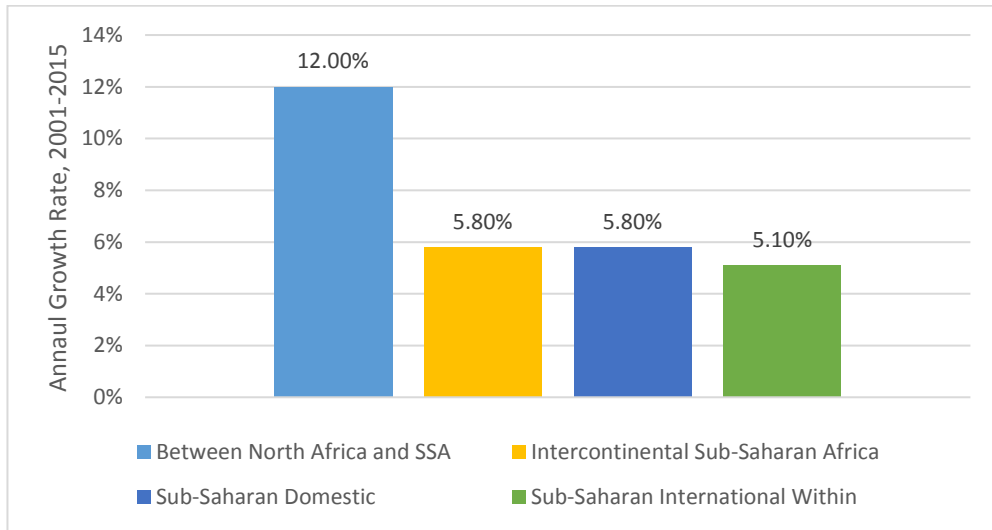
Table 1: Estimated seats and growth rates in African air transport markets

Market	Estimated seats 2001 (millions)	Estimated seats 2004 (millions)	Estimated seats 2007 (millions)	Estimated Seats 2012 (millions)	Estimated seats 2015 (millions)	Growth 2001–04	Growth 2004–07	Growth 2007–15	Growth 2001–15
All markets	47.6	53.2	70.2	89.7	104.7	3.7%	9.7%	5.1%	5.8%
All within Sub-Saharan Africa	29.2	31.4	42.8	54.2	64.2	2.4%	10.9%	5.2%	5.8%
Sub-Saharan domestic	17.1	18.4	26.5	31.9	37.6	2.4%	12.9%	4.5%	5.8%
Sub-Saharan international within Sub-Saharan	11.3	11.8	14.0	18.9	22.7	1.5%	5.9%	6.3%	5.1%
Sub-Saharan intercontinental (no North Africa)	18.4	21.8	27.3	35.5	40.5	5.8%	7.8%	5.0%	5.8%
Between North Africa and sub-Saharan Africa	0.8	1.2	2.4	3.4	3.8	15.8%	24.9%	6.2%	12.0%

Note: Numbers differ slightly from the 2007 version of the study because of improvements in adjusting seats for multi-destination flights.

Source: Author's calculations based on data by diio (2016).

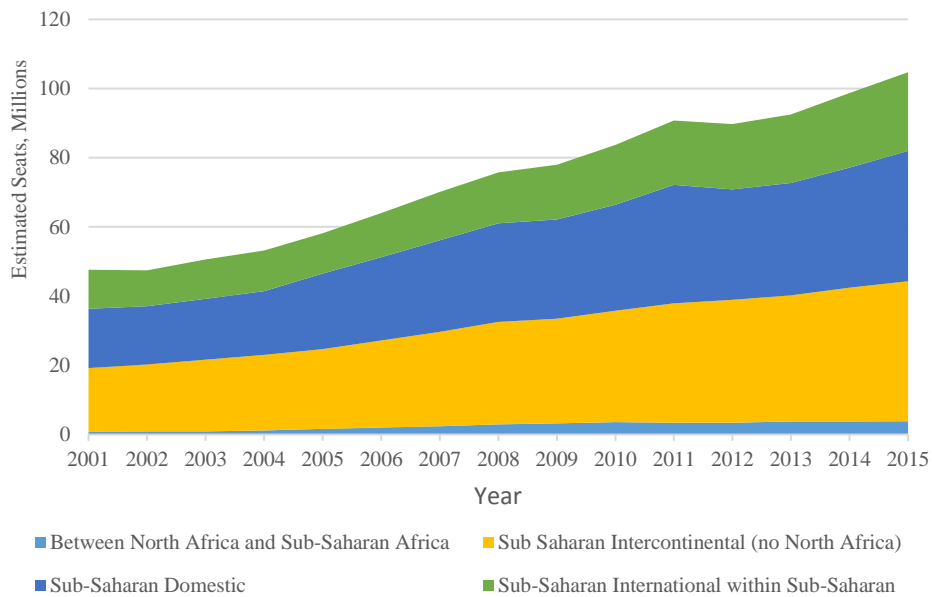
Figure 5: Growth rates in African seat capacities, 2001–15



Note: Some of the thinner markets have shown the highest growth. Overall growth rates averaged to an annualized 5.7 per cent for the period.

Source: Author’s calculations based on data by diio (2016).

Figure 6: Makeup of the African seat capacity between 2001 and 2015



Note: Both intercontinental and domestic capacities dominate with nearly the same capacities.

Source: Author’s calculations based on data by diio (2016).



Table 2: List of the top 25 airlines serving Africa, with annualized growth rates between 2007 and 2012

Rank	Airline	Estimated seat KMs 2001 (billions)	Estimated seat KMs 2007 (billions)	Estimated seat KMs 2015 (billions)	Market share 2015	Annual growth rate 2007–15	Annual Growth rate 2001–15
1	Ethiopian Airlines	4.02	11.82	35.68	11.5%	14.8%	16.9%
2	Emirates	1.72	11.03	32.68	10.5%	14.5%	23.4%
3	South African Airways	33.80	32.53	28.61	9.2%	-1.6%	-1.2%
4	Air France	13.55	18.24	23.57	7.6%	3.3%	4.0%
5	British Airways	19.67	15.89	15.01	4.8%	-0.7%	-1.9%
6	Kenya Airways	5.05	10.71	14.37	4.6%	3.7%	7.8%
7	KLM	5.99	9.40	10.64	3.4%	1.6%	4.2%
8	Turkish Airlines	0.42	0.59	8.99	2.9%	40.5%	24.5%
9	Delta Air Lines	0.00	2.95	7.96	2.6%	13.2%	
10	Air Mauritius	7.26	8.55	7.93	2.6%	-0.9%	0.6%
11	Lufthansa	3.17	5.84	7.24	2.3%	2.7%	6.1%
12	Qatar Airways	0.11	2.35	6.72	2.2%	14.0%	34.0%
13	Comair Ltd.	0.00	3.90	6.42	2.1%	6.4%	
14	CORSAIR	1.84	2.78	5.84	1.9%	9.7%	8.6%
15	TAAG – Linhas Aereas de Angola	1.32	2.39	5.41	1.7%	10.8%	10.6%
16	Air Austral	0.40	3.92	5.26	1.7%	3.7%	20.3%
17	Royal Air Maroc	0.45	2.61	4.99	1.6%	8.4%	18.8%
18	Arik Air	0.00	0.46	4.55	1.5%	33.3%	
19	Brussels Airlines N.V.	2.94	2.31	4.43	1.4%	8.5%	3.0%
20	TAP – Air Portugal	1.43	3.14	3.98	1.3%	3.0%	7.6%
21	Virgin Atlantic Airways	3.02	5.14	3.59	1.2%	-4.4%	1.2%
22	Egyptair	0.99	2.42	3.44	1.1%	4.5%	9.3%
23	Mango Airlines	0.00	0.55	3.42	1.1%	25.7%	
24	Etihad Airways	0.03	1.02	2.82	0.9%	13.5%	39.8%
25	Qantas Airways	2.04	2.25	2.73	0.9%	2.5%	2.1%

Note: The airlines represent 82.4 per cent of total market share in estimated seats.

Source: Author's calculations based on data by diio (2016).

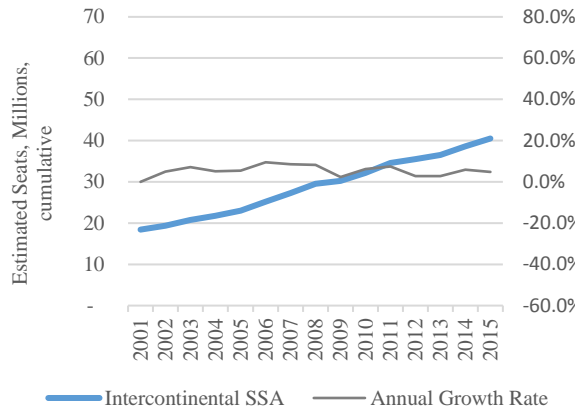
African airlines have a mix of established carriers (Ethiopian, South African, Kenyan) and fragile national flag-owned (usually, but not always, state-owned). Some are currently developing (RwandaAir), others have recently gone under, after years of struggling (Air Malawi). Some exist with no or only occasional services, depending on the availability of affordable aircraft (Air Tanzania). In general, small state-owned carriers are not economically sustainable, and create market distortions that can cause more harm than good to the industry: often routes operated by small, state-owned airlines are (at times unofficially) protected, lowering service standards and preventing competition. A complete list of carriers serving Africa in 2001, 2007, and 2015 can be found in Tables A2.1 and A2.2 in Appendix 2. The list shows that many of the small state-owned carriers, such as Air Malawi and Air Tanzania, had an extremely small number of seat kilometres served compared to the established carriers, and proved not to be sustainable.

### *Sub-Saharan Africa intercontinental capacities*

Intercontinental traffic (external traffic not including North Africa) has been growing by an average of 5.8 per cent between 2001 and 2015, from 18.4 million seats to 40.5 million. During this period there was not one year of negative growth (Figure 7), even during the economic slowdown. Direct routes grew from 260 to 363 (Figure 8).

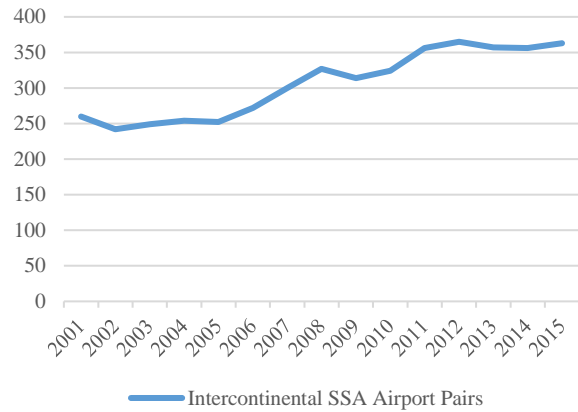
For a long time, Johannesburg has been by far the most important intercontinental gateway for sub-Saharan Africa. And as traffic has grown overall, so has that of Johannesburg, albeit at a slower pace. Significant is the emergence of Addis Ababa as a prime gateway and hub, now nearly as busy as South Africa (Table 3).

Figure 7: Intercontinental seat capacities and annual growth rates for sub-Saharan Africa



Source: Author's calculations based on data by diio (2016).

Figure 8: Number of airport pairs served with direct connections with intercontinental flights with sub-Saharan Africa



Source: Author's calculations based on data by diio (2016).

Table 3: Top 15 airports with intercontinental traffic in sub-Saharan Africa

Rank	Country	City of airport	Estimated seats 2001 (millions)	Estimated seats 2007 (millions)	Estimated seats 2015 (millions)	2015 share	Annual growth rate 2007–15	Annual Growth Rate 2001–15
1	South Africa	Johannesburg	4.44	6.02	6.69	16.5%	1.3%	3.0%
2	Ethiopia	Addis Ababa	0.73	1.95	5.10	12.6%	12.7%	14.9%
3	Kenya	Nairobi	1.39	2.47	3.19	7.9%	3.2%	6.1%
4	Sudan	Khartoum	0.86	1.54	2.76	6.8%	7.6%	8.7%
5	Nigeria	Lagos	0.96	2.02	2.64	6.5%	3.4%	7.5%
6	Mauritius	Mauritius	1.33	1.74	2.29	5.7%	3.5%	4.0%
7	South Africa	Cape Town	1.10	1.57	1.77	4.4%	1.5%	3.5%
8	Angola	Luanda	0.30	0.59	1.53	3.8%	12.7%	12.3%
9	Réunion Island	St. Denis	0.96	0.75	1.37	3.4%	7.8%	2.6%
10	Senegal	Dakar	0.79	1.14	1.15	2.8%	0.2%	2.8%
11	Ghana	Accra	0.64	0.80	1.09	2.7%	4.0%	3.9%
12	Tanzania	Dar Es Salaam	0.31	0.47	0.94	2.3%	8.9%	8.3%
13	Seychelles	Seychelles	0.31	0.41	0.87	2.2%	9.8%	7.6%
14	Nigeria	Abuja	0.09	0.26	0.66	1.6%	12.1%	15.4%
15	Cote D'Ivoire	Abidjan	0.46	0.26	0.60	1.5%	10.9%	1.8%
	Subtotal		14.64	22.01	32.65	80.6%	5.1%	5.9%
	Others		3.78	5.31	7.86	19.4%	5.0%	5.4%
	Total		18.42	27.32	40.51	100.0%	5.0%	5.8%

Source: Author's calculations based on data by diio (2016).

The UAE play an important role as a regional gateway (Table 4), and this is of no surprise: the life of gateways and hubs lies in the airlines serving them, and Emirates ranks first in overall seat kilometres serving the intercontinental market in sub-Saharan Africa, followed by a highly competitive Ethiopian Airlines.

The emergence of Emirates and Ethiopian as the prime providers of intercontinental services is a recent phenomenon, since this role traditionally has been held by South African Airlines. The

decline of South African Airways from its prominent position is the result of unanticipated challenges and, in hindsight, ill-advised management decisions (see Box 1).

### **Box 1: The rise and fall of leading airlines in Africa**

Africa has had its share of airlines that have gained tremendous market penetration and then have failed. A classic example is Air Afrique, which was an airline formed in 1960 with the help of Air France to serve Francophone Africa. The airline was owned by several African countries and was headquartered in Abidjan, Ivory Coast. The airline grew rapidly, and by 1965 it had 2,500 employees and nine aircraft. In the 1970s the airline expanded into wide-body aircraft such as the McDonnell Douglas DC-10. During this period fissures in the ownership began to emerge: Cameroun withdrew after complaining that not enough Camerouninans were in top management positions, the Central African Republic threatened to leave the ownership consortium and start their own airline, and Air Centrafrique and Chad threatened to withdraw because the airline's central African headquarters were moved to Libreville, Gabon. By the 1980s the airline had 5,100 employees, flying about 15 aircraft. The high employee per aircraft ratio (340 employees per aircraft) was only one indicator that a decline was to come: scheduling integrity came to near zero, overbooking was common, some countries never paid reserved tickets. Losses and debts mounted, and attempts at restructuring could not halt the hemorrhaging. By 2002 the airline was bankrupt, and Air France filled the capacity gap left by Air Afrique's collapse.

A more recent development of a rising star brought down by mismanagement is South African Airways. The airline was for many years considered the prime airline of Africa, with South Africa (along with Ethiopia and Cape Verde) being one of the very few sub-Saharan countries passing safety standards to the point of being allowed to provide service in the United States.

However, by 2012 the airline had started to accumulate significant losses, and a long-term purchase agreement with Airbus was placing it into such difficulties that there was the possibility of insolvency and even liquidation. The issue centred around taking delivery of ten new Airbus A320 aircraft according to a 2009 deal; it had been seen as wiser to lease five long-range Airbus 330s than to purchase 10 Airbus 320s. Since South Africa had already made pre-delivery payments for the 10 Airbus 320s, those payments would be returned, giving South African significant financial relief.

However, the deal was initially not approved by South African's board, and the counterproposal was that Airbus would sell the five 330s to a South African consortium, which would then lease the aircraft to South African Airways. Airbus determined that this did not meet their own internal checks and balances, and the then South African Minister of Finance, Nhlanhla Nene, instructed the board to go ahead with Airbus's swap arrangements. Mr. Nene was relieved of his position, and his successor, Finance Minister Pravin Gordhan, subsequently issued the same ruling. During the week of 28 November 2016, South African took its first delivery of the 5 Airbus 330s of the renegotiated deal.

Kenya Airways (commonly referred to as KQ, its IATA designator), considered a leader in the region, is also in financial trouble, and is reorganizing both its debt and its management. KQ's problems originate both out of optimistic management decisions and more out of circumstances beyond anyone's control. In 2011 the airline began its ten-year 'Project Mawingu' strategy, seeking not only to unseat arch-rival Ethiopian Airlines, but also to compete head on with Gulf airlines such as Emirates on routes to the far east. Being a member of the Sky Alliance, with ownership stakes in KQ by Air France/KLM, would only enhance this strategy.

Several things went wrong. Kenya's current market relies heavily on tourism, and the al Shabaab terrorism attacks tied to Kenya's policy towards Somalia reduced demand from Europe, the key market for Kenya Airways. As KQ attempted to develop its routes in West Africa, the Ebola scare quickly dampened demand. In 2013, KQ began a four-year streak of losses, with 2015 having been the highest losses for the airline in its history. KQ cannot expect any government subsidies—the airline was privatized years ago.

Sources: Bhaskara (2016), CAPA Centre for Aviation (2012), Ensor (2016), Olingo (2016), One Mile At A Time (2016), Reuters (2016), The National (2016), Wikipedia (2016b).

British Airways traditionally has been one of the leading airlines from Europe into East Africa, which is mostly English-speaking. However, this role has declined, as the airline has gone from serving 13 sub-Saharan countries in 2001 to only seven in 2015. In contrast, Air France has held steadfast, serving 21 to 25 countries each year between 2001 and 2015, most of them French-speaking, with no presence in East Africa. The top three airlines offering intercontinental services now consist of Emirates, Ethiopian Airlines, and Air France (Table 5).

Table 4: Top 15 intercontinental country connections with sub-Saharan Africa

Rank	Country1	Country2	Estimated seats 2001 (millions)	Estimated seats 2007 (millions)	Estimated seats 2015 (millions)	2015 share	Annual growth rate 2007–15	Annual growth rate 2001–15
1	South Africa	United Arab Emirates	0.18	0.80	2.33	5.8%	20.2%	8.0%
2	South Africa	United Kingdom	1.91	2.02	1.59	3.9%	-1.3%	3.9%
3	Réunion Island	France	0.94	0.75	1.34	3.3%	2.5%	4.9%
4	Sudan	Saudi Arabia	0.40	0.50	1.34	3.3%	9.0%	10.1%
5	Kenya	United Arab Emirates	0.29	0.59	1.01	2.5%	9.2%	1.4%
6	Nigeria	United Arab Emirates	0.00	0.36	0.96	2.4%	0.0%	5.2%
7	South Africa	Germany	0.50	0.98	0.94	2.3%	4.6%	6.5%
8	Nigeria	United Kingdom	0.51	0.88	0.83	2.0%	3.5%	7.7%
9	Sudan	United Arab Emirates	0.13	0.44	0.80	2.0%	13.5%	-8.0%
10	Ethiopia	United Arab Emirates	0.08	0.40	0.77	1.9%	17.9%	-3.4%
11	Ethiopia	China	0.01	0.16	0.75	1.9%	34.6%	2.9%
12	Mauritius	United Arab Emirates	0.00	0.24	0.71	1.8%	0.0%	0.0%
13	Seychelles	United Arab Emirates	0.02	0.10	0.68	1.7%	27.7%	0.0%
14	South Africa	United States of America	0.44	0.31	0.63	1.5%	2.6%	0.0%
15	Mauritius	France	0.48	0.47	0.61	1.5%	1.8%	0.0%
	Subtotal		5.90	9.00	15.29	0.38	6.9%	7.0%
	Others		12.53	18.32	25.22	0.62	4.1%	5.1%
	Total		18.42	27.32	40.51	1.00	5.0%	5.8%

Source: Author's calculations based on data by diio (2016).

Table 5: Top 15 airlines serving intercontinental routes in sub-Saharan Africa

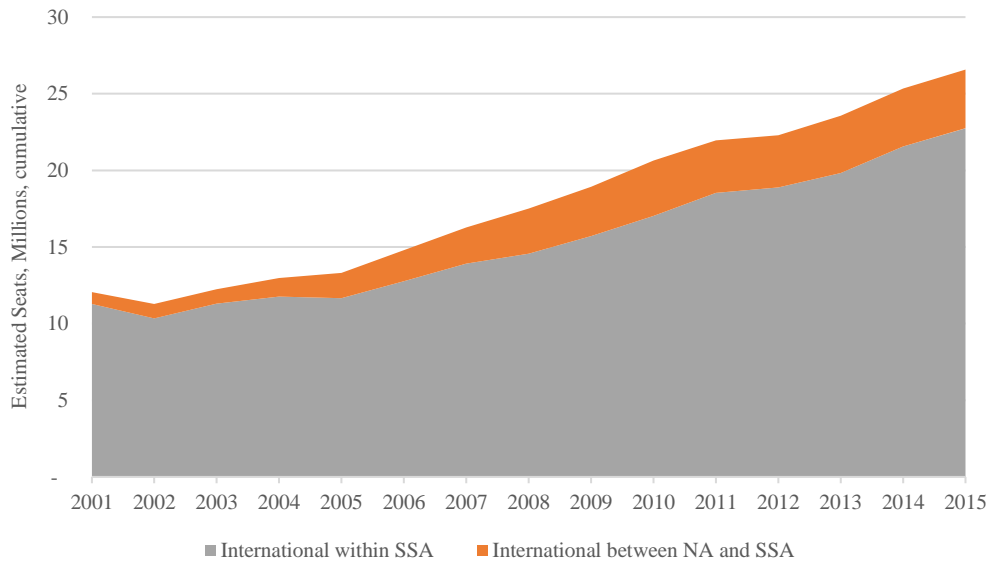
Rank	Airline	Estimated seat KMs 2001 (billions)	Estimated seat KMs 2007 (billions)	Estimated seat KMs 2015 (billions)	Market share 2015	Annual growth rate 2007–15	Annual growth rate 2001–15
1	Emirates	1.69	11.00	32.80	13.7%	14.6%	23.6%
2	Ethiopian Airlines	2.89	7.97	24.24	10.1%	14.9%	16.4%
3	Air France	13.55	18.35	23.70	9.9%	3.3%	4.1%
4	South African Airways	23.52	22.81	18.00	7.5%	-2.9%	-1.9%
5	British Airways	16.75	15.98	15.10	6.3%	-0.7%	-0.7%
6	KLM	5.85	9.45	10.70	4.5%	1.6%	4.4%
7	Kenya Airways	3.04	6.76	9.00	3.7%	3.6%	8.0%
8	Turkish Airlines	0.37	0.55	8.98	3.7%	41.7%	25.5%
9	Delta Air Lines	-	2.46	8.01	3.3%	15.9%	
10	Lufthansa	2.87	5.88	7.28	3.0%	2.7%	6.9%
11	Air Mauritius	6.72	7.73	6.82	2.8%	-1.6%	0.1%
12	Qatar Airways	0.11	2.36	6.76	2.8%	14.0%	34.0%
13	CORSAIR	1.84	2.79	5.88	2.4%	9.8%	8.7%
14	Air Austral	-	3.55	4.67	1.9%	3.5%	
15	TAAG – Linhas Aereas de Angola	0.94	1.96	4.30	1.8%	10.3%	11.5%
	Subtotal	80.14	119.61	186.24	77.6%	8.0%	2.9%
	Others	44.11	54.79	53.90	22.4%	3.1%	7.8%
	Total	124.25	174.40	240.14	100.0%	-4.4%	1.2%

Source: Author's calculations based on data by diio (2016).

## 2.2 International traffic within Africa

After a short decline in capacity between 2001 and 2002, international traffic within Africa showed strong growth, especially within sub-Saharan Africa, though international traffic between sub-Saharan Africa and North Africa also increased (Figure 9).

Figure 9: International capacities within the African continent



Source: Author's calculations based on data by diio (2016).

### *International capacities within sub-Saharan Africa*

Though there has been some increase in direct international connectivity measured in airport pairs served between Sub-Saharan countries, this dwarfs the overall significant increase in overall capacity, from 10.3 million seats in 2001 to 22.7 million in 2015 (Figures 10 and 11). Average growth has been 5.1 per cent for the period.

Figure 10: International seat capacities and annual growth rates for travel within sub-Saharan Africa



Source: Author's calculations based on data by diio (2016).

Figure 11: Number of airport pairs served with direct connections on international flights within sub-Saharan Africa



Source: Author's calculations based on data by diio (2016).

For a long time, Johannesburg has been by far the most important intercontinental gateway for sub-Saharan Africa and as traffic has grown overall, so has that of Johannesburg, albeit at a slower pace. Significant is the emergence of Addis Ababa as a prime gateway and hub, now edging up to South Africa (Table 6). Some of the top connections involve South Africa and its neighbours (Zimbabwe, Namibia), but also interestingly the islands of Mauritius and Réunion. The significance of the connection between Kenya and Tanzania is easily explained: Their border shares some of the most important tourist destinations in East Africa (Table 7).

Table 6: Top 15 airports for international travel within sub-Saharan Africa

Rank	Country	City	Estimated seats 2001 (millions)	Estimated seats 2007 (millions)	Estimated seats 2015 (millions)	2015 share	Annual growth rate 2007–15	Annual Growth rate 2001–15
1	South Africa	Johannesburg	3.83	5.60	7.48	16.4%	3.7%	4.9%
2	Ethiopia	Addis Ababa	0.43	1.48	4.35	9.6%	14.5%	18.0%
3	Kenya	Nairobi	2.06	2.61	3.98	8.7%	5.4%	4.8%
4	Mauritius	Mauritius	1.07	1.04	1.59	3.5%	5.4%	2.8%
5	Nigeria	Lagos	0.83	1.07	1.53	3.4%	4.6%	4.5%
6	Réunion Island	St. Denis	0.82	0.78	1.31	2.9%	6.7%	3.4%
7	Cote D'Ivoire	Abidjan	0.88	0.54	1.29	2.8%	11.6%	2.8%
8	Ghana	Accra	0.59	0.66	1.23	2.7%	8.1%	5.4%
9	Zimbabwe	Harare	0.88	0.77	1.18	2.6%	5.4%	2.1%
10	Namibia	Windhoek	0.50	0.78	1.11	2.4%	4.6%	5.9%
11	Tanzania	Dar Es Salaam	0.51	0.72	1.03	2.3%	4.7%	5.1%
12	Uganda	Entebbe/Kampala	0.73	0.89	0.96	2.1%	0.9%	2.0%
13	Senegal	Dakar	0.55	0.78	0.88	1.9%	1.5%	3.3%
14	Angola	Luanda	0.37	0.47	0.85	1.9%	7.8%	6.2%
15	Zambia	Lusaka	0.50	0.88	0.80	1.8%	-1.1%	3.5%
	Subtotal		14.54	19.05	29.57	65.0%	5.6%	5.2%
	Others		8.01	8.77	15.92	35.0%	7.7%	5.0%
	Total		22.55	27.82	45.48	100.0%	6.3%	5.1%

Note: As this summary is by airport, totals are double counted.

Source: Author's calculations based on data by diio (2016).

Table 7: Top 25 international country connections within sub-Saharan Africa

Rank	Country1	Country2	Estimated seats 2001 (millions)	Estimated seats 2007 (millions)	Estimated seats 2015 (millions)	2015 share	Annual growth rate 2007–15	Annual growth rate 2001–15
1	Zimbabwe	South Africa	0.84	0.77	1.25	5.5%	2.9%	8.0%
2	South Africa	Namibia	0.57	0.79	1.07	4.7%	4.5%	3.9%
3	Réunion Island	Mauritius	0.66	0.49	0.95	4.2%	2.6%	4.9%
4	Tanzania	Kenya	0.46	0.71	0.83	3.7%	4.4%	10.1%
5	South Africa	Mozambique	0.26	0.49	0.77	3.4%	8.1%	1.4%
6	Zambia	South Africa	0.40	0.99	0.74	3.3%	4.6%	5.2%
7	South Africa	Botswana	0.33	0.42	0.73	3.2%	5.8%	6.5%
8	Nigeria	Ethiopia	0.04	0.18	0.61	2.7%	21.3%	7.7%
9	Kenya	Ethiopia	0.07	0.09	0.60	2.6%	16.9%	-8.0%
10	South Africa	Kenya	0.27	0.37	0.48	2.1%	4.3%	-3.4%
11	Uganda	Kenya	0.53	0.45	0.45	2.0%	-1.1%	2.9%
12	Nigeria	Ghana	0.27	0.30	0.45	2.0%	3.8%	0.0%
13	South Africa	Mauritius	0.20	0.32	0.41	1.8%	5.0%	0.0%
14	Sudan	Ethiopia	0.03	0.13	0.39	1.7%	19.7%	0.0%
15	South Africa	Angola	0.20	0.24	0.37	1.6%	4.4%	0.0%
	Subtotal		5.13	6.74	10.11	0.44	5.2%	5.0%
	Others		6.15	7.17	12.63	0.56	7.3%	5.3%
	Total		11.27	13.91	22.74	1.00	6.3%	5.1%

Source: Author's calculations based on data by diio (2016).

It is in the international markets within sub-Saharan Africa where Ethiopian Airlines' strategy of expansion, often using fifth freedom flights, has paid off. Between 2007 and 2015, the airline has nudged the long-leading South African Airways into second place (Table 8).

Table 8: Top 25 airlines providing international service within sub-Saharan Africa

Rank	Airline	Estimated seat KMs 2001 (billions)	Estimated seat KMs 2007 (billions)	Estimated seat KMs 2015 (billions)	Market share 2015	Annual growth rate 2007–15	Annual growth rate 2001–15
1	Ethiopian Airlines	0.98	3.70	10.87	30.3%	14.4%	18.8%
2	South African Airways	4.00	4.39	6.76	18.9%	5.5%	3.8%
3	Kenya Airways	1.66	3.46	5.02	14.0%	4.7%	8.2%
4	Arik Air	-	-	1.20	3.3%		
5	Air Mauritius	0.50	0.79	1.06	3.0%	3.8%	5.5%
6	TUIfly Gmbh	-	-	0.94	2.6%		
7	SA Airlink dba South African Airlink	-	0.41	0.84	2.3%	9.5%	
8	RwandAir Limited	-	0.16	0.79	2.2%	22.3%	
9	TAAG – Linhas Aereas de Angola	0.36	0.38	0.70	2.0%	7.8%	4.8%
10	Air Namibia (Pty) Ltd	0.31	0.54	0.69	1.9%	3.1%	5.8%
11	Air Austral	0.40	0.39	0.62	1.7%	6.0%	3.2%
12	ASKY	-	-	0.54	1.5%		
13	Comair Ltd.	-	0.37	0.48	1.4%	3.6%	
14	Sudan Airways Co Ltd	0.34	0.15	0.40	1.1%	12.8%	1.2%
15	LAM - Linhas Aereas De Mocambi	0.06	0.11	0.38	1.1%	16.5%	13.7%
	Subtotal	8.61	14.85	31.28	87.3%	9.8%	9.7%
	Others	6.31	6.17	4.56	12.7%	-3.7%	-2.3%
	Totals	14.92	21.01	35.84	100.0 %	6.9%	6.5%

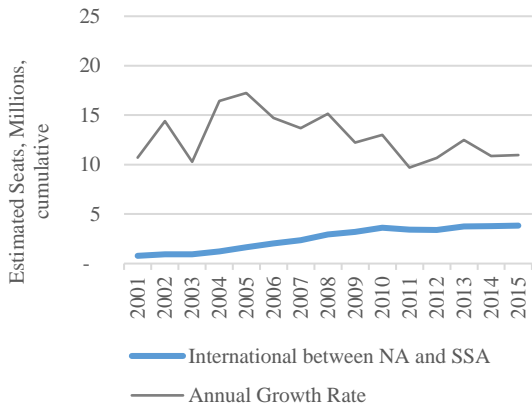
Note: Of an estimated billion seat kilometres flown, these 15 airlines constitute over 85.5 per cent of the market, meaning the market has become slightly more concentrated when compared to the 18 billion seats and 82 per cent market share of the 15 airlines in 2007. Ethiopian has now taken the first spot in seat kilometres flown.

Source: Author's calculations based on data by diio (2016).

#### *International capacities between North and sub-Saharan Africa*

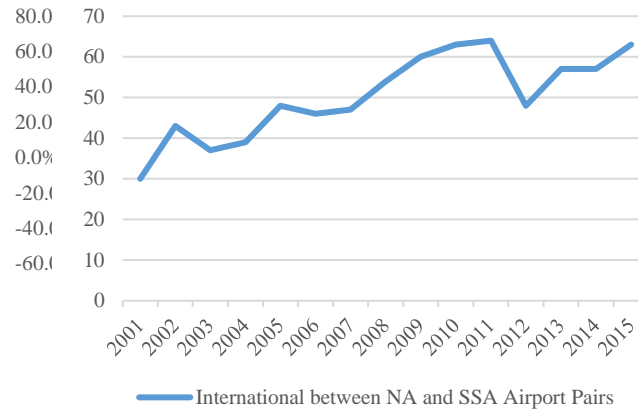
Between 2003 and 2008 some of the highest annual growth rates in seat capacity in Africa can be found between North and sub-Saharan Africa, topping 30 per cent in 2004 (Figure 12). Overall, the market averaged 12.3 per cent annual growth between 2001 and 2015. The number of routes more than doubled between 2001 and 2015, from 30 airport pairs to over 60 in 2015 (Figure 13). Much of this has to do with the new role of Royal Air Maroc: with scarce connections within West Africa, the airline developed its connections into the region. The top 15 routes include routes with Morocco and Senegal, Mauritania, Cote D'Ivoire, Mali, Guinea, Congo, Nigeria, Cameroon, and Sierra Leone (Table 10). Royal Air Maroc ranks first in the intra-North and Sub-Saharan market, with a 45.9 per cent market share, followed by Egypt Air with 31.4 per cent (Table 11). Not surprisingly, Casablanca ranks first in this market (Table 9), albeit by a small margin over Cairo.

Figure 12: International seat capacities and annual growth rates for travel between North and sub-Saharan Africa



Source: Author's calculations based on data by diio (2016).

Figure 13: Number of airport pairs served with direct connections on international flights between Sub-Saharan and North Africa



Source: Author's calculations based on data by diio (2016).

Table 9: Top 15 airports for international travel between North and sub-Saharan Africa

Rank	Country	City	Estimated seats 2001 (millions)	Estimated seats 2007 (millions)	Estimated seats 2015 (millions)	2015 share	Annual growth rate 2007-15	Annual growth rate 2001-15
1	Morocco	Casablanca	0.18	0.96	1.68	21.9%	7.2%	17.4%
2	Egypt	Cairo	0.47	0.98	1.66	21.7%	6.9%	9.5%
3	Sudan	Khartoum	0.21	0.47	0.78	10.2%	6.4%	10.0%
4	Senegal	Dakar	0.06	0.27	0.34	4.5%	3.0%	13.4%
5	Mauritania	Nouakchott	0.04	0.17	0.21	2.7%	2.4%	13.2%
6	Cote D'Ivoire	Abidjan	0.06	0.13	0.20	2.6%	5.6%	9.3%
7	Algeria	Algiers	0.06	0.07	0.19	2.5%	13.6%	9.1%
8	Ethiopia	Addis Ababa	0.07	0.08	0.18	2.4%	10.6%	7.1%
9	Tunisia	Tunis	0.01	0.11	0.18	2.3%	5.5%	22.9%
10	Mali	Bamako	0.05	0.16	0.15	2.0%	-0.4%	8.5%
11	Nigeria	Lagos	0.01	0.10	0.15	1.9%	4.9%	21.8%
12	Niger	Niamey	0.03	0.06	0.14	1.8%	9.7%	11.9%
13	South Africa	Johannesburg	0.06	0.17	0.12	1.5%	-4.7%	4.7%
14	Guinea	Conakry	0.02	0.07	0.11	1.5%	5.9%	12.9%
15	Ghana	Accra	0.01	0.09	0.10	1.4%	2.2%	16.1%
	Subtotal		1.32	3.90	6.19	80.7%	5.9%	11.7%
	Others		0.25	0.84	1.48	19.3%	7.4%	13.7%
	Totals		1.56	4.74	7.67	100.0%	6.2%	12.0%

Source: Author's calculations based on data by diio (2016).



Table 10: Top country connections between North and sub-Saharan Africa

Rank	Country1	Country2	Estimated seats 2001 (millions)	Estimated seats 2007 (millions)	Estimated seats 2015 (millions)	2015 share	Annual growth rate 2007–15	Annual growth rate 2001–15
1	Sudan	Egypt	0.18	0.44	0.74	19.4%	6.9%	10.8%
2	Senegal	Morocco	0.05	0.22	0.23	6.0%	0.3%	12.1%
3	Nigeria	Egypt	0.02	0.09	0.23	5.9%	11.6%	17.1%
4	Ethiopia	Egypt	0.07	0.08	0.18	4.7%	10.6%	7.1%
5	Morocco	Mauritania	0.03	0.11	0.14	3.6%	2.3%	11.6%
6	Morocco	Cote D'Ivoire	0.03	0.10	0.13	3.5%	3.7%	10.6%
7	Morocco	Mali	0.02	0.10	0.12	3.1%	2.3%	12.3%
8	South Africa	Egypt	0.06	0.17	0.12	3.0%	-4.7%	4.9%
9	Morocco	Guinea	0.02	0.07	0.11	3.0%	5.9%	12.9%
10	Morocco	Congo	0.00	0.03	0.09	2.3%	15.3%	0.0%
11	Eritrea	Egypt	0.04	0.03	0.08	2.2%	13.6%	5.4%
12	Nigeria	Morocco	0.00	0.00	0.08	2.2%	0.0%	0.0%
13	Senegal	Algeria	0.01	0.01	0.08	2.1%	26.1%	17.0%
14	Morocco	Cameroon	0.00	0.04	0.08	2.0%	8.2%	0.0%
15	Sierra Leone	Morocco	0.00	0.01	0.07	1.8%	31.3%	0.0%
	Subtotal		0.53	1.51	2.48	64.7%	6.4%	11.6%
	Others		0.25	0.83	1.29	35.3%	5.7%	12.4%
	Total		0.78	2.34	3.77	100.0%	6.1%	11.9%

Source: Author's calculations based on data by diio (2016).

Table 11: Airlines serving routes between North and sub-Saharan Africa

Rank	Airline	Estimated seat KMs 2001 (billions)	Estimated seat KMs 2007 (billions)	Estimated seat KMs 2015 (billions)	Market share 2015	Annual growth rate 2007–15	Annual Growth rate 2001–15
1	Royal Air Maroc	0.41	2.62	5.00	45.9%	8.4%	19.6%
2	Egyptair	0.96	2.43	3.42	31.4%	4.4%	9.5%
3	Air Algerie	0.18	0.20	0.57	5.2%	13.6%	8.4%
4	Tunis Air	0.04	0.40	0.55	5.1%	4.1%	20.6%
5	Sudan Airways Co Ltd	0.10	0.26	0.50	4.6%	8.5%	12.0%
6	Afriqiyah Airways	-	0.70	0.29	2.7%	-10.4%	
7	Ethiopian Airlines	0.05	0.11	0.24	2.2%	10.3%	11.8%
8	Mauritanian Airlines International	-	-	0.13	1.2%		
9	Tarco Airways	-	-	0.12	1.1%		
10	Air Bashkortostan Ltd	-	-	0.03	0.3%		
11	Nile Air	-	-	0.02	0.2%		
12	AlMasria Universal Airlines	-	-	0.02	0.2%		
13	African Express Airways (K) Ltd	-	-	0.01	0.1%		
	Subtotal	1.75	6.72	10.90	100.0%	6.2%	14.0%
	Others	0.49	0.23	-			
	Total	2.24	6.96	10.90	100.0%	5.8%	12.0%

Source: Author's calculations based on data by diio (2016).

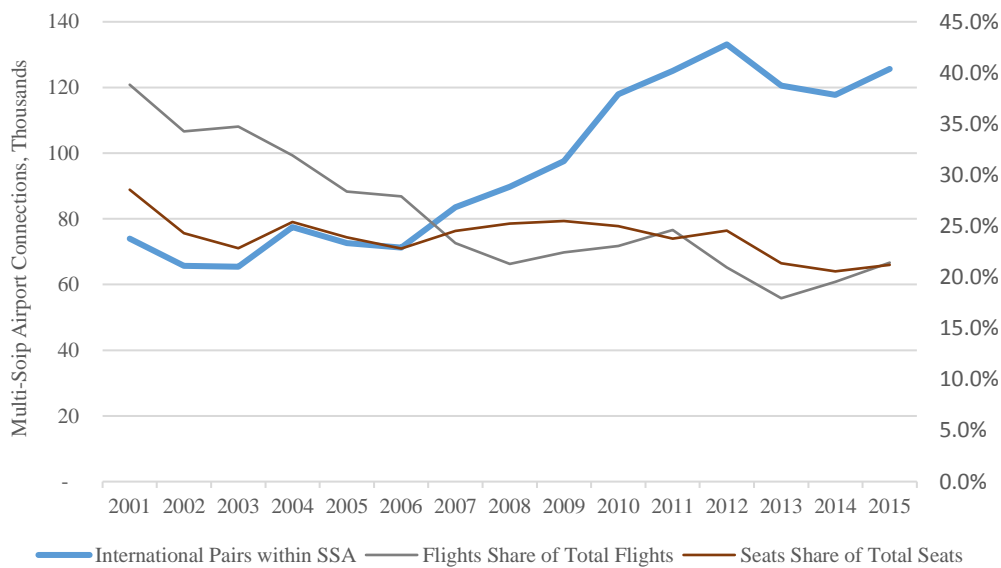
### *The rise of fifth freedom flights in sub-Saharan Africa*

The Yamoussoukro Decision of November 1999 aimed at liberalizing international travel between African countries by promoting free pricing, lifting capacity and frequency restraints, and allowing fifth freedom flights. Given the overall small size of the African air transport market, allowing fifth freedom flights is a significant step, since it allows the capacity of an aircraft to be spread amongst multiple international destinations on one marketed flight. This allows, for example, a flight to originate out of Addis Ababa, land in Nairobi, Kenya to drop off and pick up passengers, continue on to Kilimanjaro in Tanzania to drop off passengers destined there, move on to Dar es Salaam,

drop off passengers there from both Addis Ababa and Nairobi, and pick up passengers for the last leg back to Addis Ababa.<sup>3</sup>

The success in the implementation can be measured in the number of international airport connections served by multi-stop flights in Africa. Sub-Saharan services have thrived, with multi-legged connections having increased significantly. The share of seats on those flights as compared to the overall total has remained within a 20 per cent to 25 per cent band, showing the importance of these flights as being about one-quarter of the overall capacity. The total percentage share of the flights themselves over total international flights in SAA has declined, indicating that the multi-legged international flights are using larger aircraft with higher seat capacities (Figure 14).

Figure 14: Number of international airport pairs served on multi-stop flights in sub-Saharan Africa, and the share of total international routes and seats



Source: Author’s calculations based on data by diio (2016).

The fifth freedom route model has become the keystone of the development of services by key African airlines, with both Ethiopian and Kenyan Airlines having drastically increased the number of these segments. It also appears to be the cornerstone strategy of some newcomers, such as RwandaAir<sup>4</sup> (Table 12).

<sup>3</sup> Note that there are no passengers being picked up in Kilimanjaro for Dar-es-Salaam, since this is a domestic route, and a foreign airline serving domestic routes in another country would consist of cabotage, which in air transport generally does not occur.

<sup>4</sup> The former CEO of Ethiopian Airlines is now (June 2016) Chairman of the Board of RwandaAir.

Table 12: Airlines and their multi-legged international routes in sub-Saharan Africa

Rank	Airline	Estimated connections 2001	Estimated connections 2007	Estimated connections 2015	Market share 2015	Annual growth rate 2007–15	Annual growth rate 2001–15
1	Ethiopian Airlines	10,049	14,079	23,569	18.8%	6.7%	6.3%
2	Kenya Airways	3,835	12,493	22,412	17.8%	7.6%	13.4%
3	ASKY	-	-	11,102	8.8%		
4	RwandAir Limited	-	312	10,452	8.3%	55.1%	
5	TUfly Gmbh	-	-	4,758	3.8%		
6	Arik Air	-	-	4,355	3.5%		
7	LAM - Linhas Aereas De Mocambi	221	2,210	4,290	3.4%	8.6%	23.6%
8	Precision Air Services Ltd	481	2,535	4,212	3.4%	6.6%	16.8%
9	Senegal Airlines	-	-	3,445	2.7%		
10	Cameroon Airlines Corporation dba Camair-Co	-	-	3,276	2.6%		
11	South African Airways	1,196	1,534	3,237	2.6%	9.8%	7.4%
12	Equatorial Congo Airlines (ECAIR)	-	-	2,730	2.2%		
13	Mauritanian Airlines International	-	-	2,327	1.9%		
14	TAAG - Linhas Aereas de Angola	390	832	2,210	1.8%	13.0%	13.2%
15	Trans Air Congo (TAC)	-	702	2,067	1.6%	14.5%	
	Subtotal	16,172	34,697	104,442	83.2%	14.8%	14.3%
	Others	57,798	48,854	21,151	16.8%	-9.9%	-6.9%
	Total	73,970	83,551	125,593	100.0%	5.2%	3.9%

Source: Author's calculations based on data by diio (2016).

### 2.3 Domestic traffic

Domestic traffic in sub-Saharan Africa has been climbing steadily, from 17 million seats in 2001 to nearly 38 million seats in 2015, with the only decline being between 2011 and 2012 (Figure 15). However, as passenger volume has skyrocketed, the number of direct domestic routes has declined between 2001 and 2009 (Figure 16). One may, incorrectly, assume that the decline in direct connectivity may have to do with the emergence of hubs such as Bole International Airport in Addis Abeba; however, the decline of routes was a universal phenomenon, with the number of routes involving hubs such as Bole also declining between 2001 and 2009, as domestic traffic actually grew. Another theory could be the increasing urbanization centered on larger African cities, with less populated destinations falling off the domestic air transport grid. Also there could be modal shifts between destinations as the road networks improve.

By far the largest domestic air transport market is South Africa (Table 13), with Nigeria being a distant second. Both Kenya and Tanzania have the rift valley as an important tourist destination, which is also a driver for domestic services. South Africa also dominates in the number of seats for domestic airports (Table 14), and nine out of the top 15 domestic routes are in South Africa (Table 15). The three top domestic airlines, Comair, South African Airways, and Mango Airline are all based in South Africa, and command over 50 per cent of all domestic seat capacity in sub-Saharan Africa (Table 16).

Figure 15: Domestic seat capacities and growth rates within sub-Saharan Africa

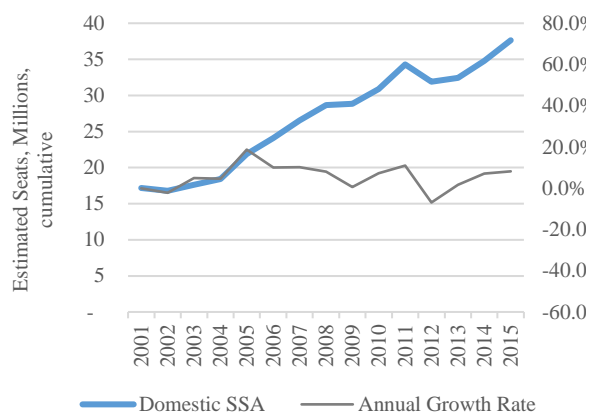
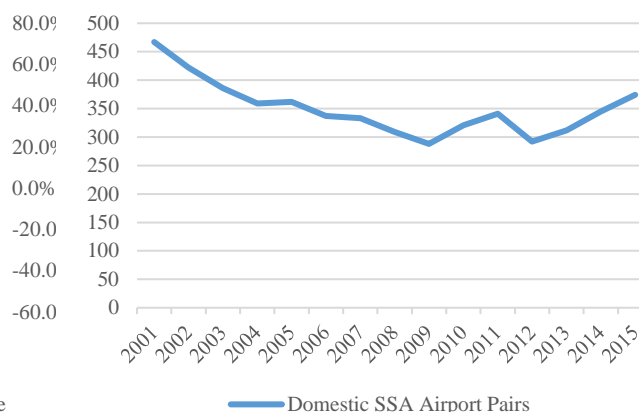


Figure 16: Number of airport pairs served with direct connections on domestic flights in sub-Saharan Africa



Source: Author's calculations based on data by diio (2016).

Source: Author's calculations based on data by diio (2016).

Table 13: Top 15 countries with domestic travel in sub-Saharan Africa

Rank	Country	Estimated seats 2001 (millions)	Estimated seats 2007 (millions)	Estimated seats 2015 (millions)	2015 share	Annual growth rate 2007–15	Annual growth rate 2001–15
1	South Africa	10.89	16	18.56	49.3%	2.1%	3.9%
2	Nigeria	0.52	5	6.62	17.6%	4.7%	19.9%
3	Kenya	1.05	1	2.02	5.4%	8.9%	4.8%
4	Tanzania	0.45	1	1.62	4.3%	9.6%	9.6%
5	Ethiopia	0.34	0	1.29	3.4%	21.2%	10.0%
6	Ghana	-	0	1.08	2.9%	40.4%	
7	Congo	0.23	0	0.99	2.6%	21.3%	11.0%
8	Angola	0.05	1	0.78	2.1%	3.8%	22.0%
9	Mozambique	0.25	0	0.76	2.0%	8.5%	8.3%
10	Sudan	0.21	0	0.68	1.8%	13.0%	9.0%
11	Cape Verde	0.48	0	0.40	1.1%	4.3%	-1.3%
12	Madagascar	0.60	1	0.40	1.1%	-4.6%	-2.9%
13	Congo DRC	0.19	0	0.39	1.0%	16.0%	5.2%
14	Zimbabwe	0.22	0	0.28	0.8%	12.8%	1.7%
15	Cameroon	0.23	0	0.25	0.7%	24.0%	0.5%
	Subtotal	15.71	25.06	36.13	96.0%	4.7%	6.1%
	Others	1.45	1.49	1.51	4.0%	0.2%	0.3%
	Total	17.17	26.55	37.64	100.0%	4.5%	5.8%

Source: Author's calculations based on data by diio (2016).

Table 14: Top 15 airports for domestic travel within sub-Saharan Africa

Rank	Country	City	Estimated seats 2001 (millions)	Estimated seats 2007 (millions)	Estimated seats 2015 (millions)	2015 share	Annual growth rate 2007–15	Annual growth rate 2001–15
1	South Africa	Johannesburg	9.25	13.19	13.56	18.0%	0.3%	2.8%
2	South Africa	Cape Town	5.51	7.72	9.57	12.7%	2.7%	4.0%
3	South Africa	Durban	3.89	5.35	5.73	7.6%	0.9%	2.8%
4	Nigeria	Lagos	0.51	3.96	4.78	6.4%	2.4%	17.3%
5	Nigeria	Abuja	0.30	2.29	3.72	4.9%	6.3%	19.7%
6	South Africa	Port Elizabeth	1.20	1.86	2.23	3.0%	2.3%	4.5%
7	South Africa	Lanseria	-	-	1.85	2.5%		
8	Nigeria	Port Harcourt	0.20	1.04	1.64	2.2%	5.8%	16.4%
9	Kenya	Nairobi	0.81	0.82	1.47	2.0%	7.6%	4.4%
10	Tanzania	Dar Es Salaam	0.33	0.56	1.36	1.8%	11.7%	10.7%
11	Ethiopia	Addis Ababa	0.24	0.20	1.16	1.5%	24.1%	11.8%
12	Ghana	Accra	-	0.07	1.08	1.4%	41.0%	
13	Congo	Brazzaville	0.19	0.21	0.99	1.3%	21.3%	12.7%
14	South Africa	East London	0.52	1.01	0.96	1.3%	-0.6%	4.5%
15	Congo	Pointe Noire	0.22	0.21	0.95	1.3%	20.6%	11.1%
		Subtotal	23.15	38.50	51.05	67.8%	3.6%	5.8%
		Others	45.51	67.70	99.51	32.2%	4.9%	5.7%
		Total	68.66	106.20	150.56	100.0%	4.5%	5.8%

Source: Author's calculations based on data by diio (2016).

Table 15: Top 15 domestic city connections within sub-Saharan Africa

Rank	Country	City1	City2	Estimated seats 2001 (millions)	Estimated seats 2007 (millions)	Estimated seats 2015 (millions)	2015 share	Annual growth rate 2007–15	Annual growth rate 2001–15
1	South Africa	Cape Town	Johannesburg	4.29	5.67	5.65	15.0%	2.0%	8.0%
2	South Africa	Durban	Johannesburg	2.81	3.83	3.38	9.0%	1.3%	3.9%
3	Nigeria	Abuja	Lagos	0.30	1.87	1.89	5.0%	14.1%	4.9%
4	South Africa	Johannesburg	Port Elizabeth	0.75	1.22	1.50	4.0%	5.1%	10.1%
5	South Africa	Cape Town	Durban	0.73	1.07	1.33	3.5%	4.4%	1.4%
6	South Africa	Cape Town	Lanseria	0.00	0.00	1.20	3.2%	0.0%	5.2%
7	Nigeria	Lagos	Port Harcourt	0.19	0.63	1.04	2.8%	12.8%	6.5%
8	Congo	Brazzaville	Pointe Noire	0.19	0.21	0.95	2.5%	12.3%	7.7%
9	Kenya	Mombasa	Nairobi	0.59	0.69	0.90	2.4%	3.1%	-8.0%
10	South Africa	George-Arpt	Johannesburg	0.26	0.60	0.70	1.9%	7.4%	-3.4%
11	South Africa	East London	Johannesburg	0.32	0.63	0.66	1.7%	5.3%	2.9%
12	South Africa	Durban	Lanseria	0.00	0.00	0.65	1.7%	0.0%	0.0%
13	Nigeria	Abuja	Port Harcourt	0.00	0.28	0.59	1.6%	0.0%	0.0%
14	South Africa	Cape Town	Port Elizabeth	0.21	0.38	0.54	1.4%	6.9%	0.0%
15	Ghana	Accra	Kumasi	0.00	0.05	0.51	1.3%	0.0%	0.0%
		Subtotal		10.64	17.13	21.50	57.1%	2.9%	5.2%
		Others		6.53	9.42	16.14	42.9%	7.0%	6.7%
		Total		17.17	26.55	37.64	1.00	4.5%	5.8%

Source: Author's calculations based on data by diio (2016).

Table 16: Top 15 airlines providing domestic travel services within sub-Saharan Africa

Rank	Airline	Estimated seat KMs 2001 (billions)	Estimated seat KMs 2007 (billions)	Estimated seat KMs 2015 (billions)	Market share 2015	Annual growth rate 2007–15	Annual growth rate 2001–15
1	Comair Ltd.	-	3.56	5.97	23.0%	6.7%	
2	South African Airways	6.48	5.52	4.01	15.5%	-3.9%	-3.4%
3	Mango Airlines	-	0.55	3.34	12.9%	25.3%	
4	Arik Air	-	0.46	1.54	6.0%	16.4%	
5	Safair (Proprietary) Ltd	-	-	1.22	4.7%		
	South African Airways Express dba						
6	Congo Express	-	0.25	1.22	4.7%	21.9%	
7	Lauda Air	-	-	1.07	4.1%		
8	LAM – Linhas Aereas De Mocambi	0.22	0.22	0.75	2.9%	16.8%	9.2%
9	SA Airlink dba South African Airlink	-	0.52	0.73	2.8%	4.3%	
10	Fly 540 Tanzania Ltd	-	-	0.57	2.2%		
11	Ethiopian Airlines	0.13	0.10	0.53	2.0%	22.7%	10.8%
12	Dana Airlines Limited	-	-	0.47	1.8%		
13	TAAG – Linhas Aereas de Angola	0.03	0.06	0.44	1.7%	28.5%	21.9%
14	Kenya Airways	0.29	0.35	0.43	1.7%	2.8%	3.0%
15	Braathens	-	-	0.33	1.3%		
	Subtotal	7.14	11.58	22.62	87.2%	8.7%	8.0%
	Others	5.40	7.61	3.32	12.8%	-9.9%	-3.2%
	Total	12.54	19.20	25.94	100.0%	3.8%	5.0%

Source: Author's calculations based on data by diio (2016).

## 2.4 Competition

A common measure of competitiveness in a given market is the Herfindahl-Hirschmann index (HH Index), which is a measure of market concentration used both by the US Department of Commerce and the Department of Justice in allowing corporate mergers. Conceptually the HH Index is a simple measure: it is simply the sum of the squares of each market participant's market share. The result of the sum allows an interpretation of market concentration (Table 17).

Table 17: Interpretation of HH Index values

HH Index calculation result	State of market concentration
<0.10	Fully competitive
>-0.10 and <0.15	Lightly concentrated
>= 0.15 and <0.25	Moderately concentrated
>= 0.25 and < 1.00	Highly concentrated
=1.00	Monopoly

Source: Author's presentation based on Wikipedia (2016a)

One way to compute this index would be to total all the seats in a given market segment, such as intercontinental travel with sub-Saharan Africa, and then create the same summation by airline in the market, with the percentage share. This, however, would miss the fact that true competitiveness should be measured on a per route basis. A better measure of competitiveness would be to analyse the competitiveness of each route in a market segment, and then find an overall percentage of routes that fall within a given state of market concentration.

The competitiveness of each route would be calculated as follows:

$$H = \sum_{i=1}^n s_i^2$$

Where  $n$  = the number of airlines serving the route, and  $s$  ( $i = 1$  to  $n$ ) = the individual market shares per airline.

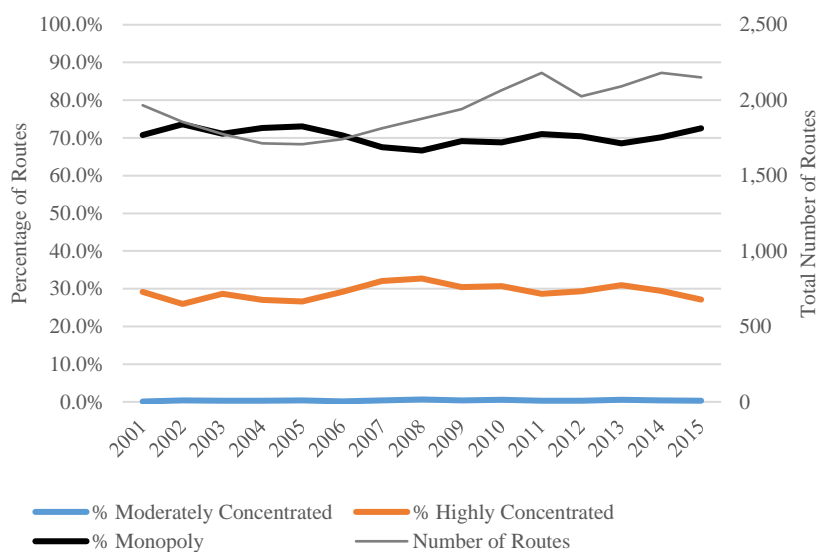
The following sections present the results of the calculations for each market segment.

### *Overall competitiveness*

Routes in general show an almost symmetric pattern of swinging between being highly concentrated and a complete monopoly with only one airline serving (Figure 17). The percentage of routes that are moderately concentrated is very low— their share hovers between 0.1 and 0.6 per cent of all routes, with 2006 having had the highest share. Overall competitiveness rose between 2005 and 2007, with the number of highly concentrated routes gaining at the loss of monopolized routes. This trend reversed itself in 2008, and as the number of total routes rose, there are indications that the new routes may have been single-airline routes.

The symmetry of these patterns is common in all market segments, with some differences in severity. Intercontinental routes with sub-Saharan Africa will, for example, show that over 80 per cent of routes are in a monopoly state, whereas in Northern Africa the percentage has dropped from over 70 to slightly above 60.

Figure 17: Percentage of routes by market concentration, all travel with Africa, and the total number of routes

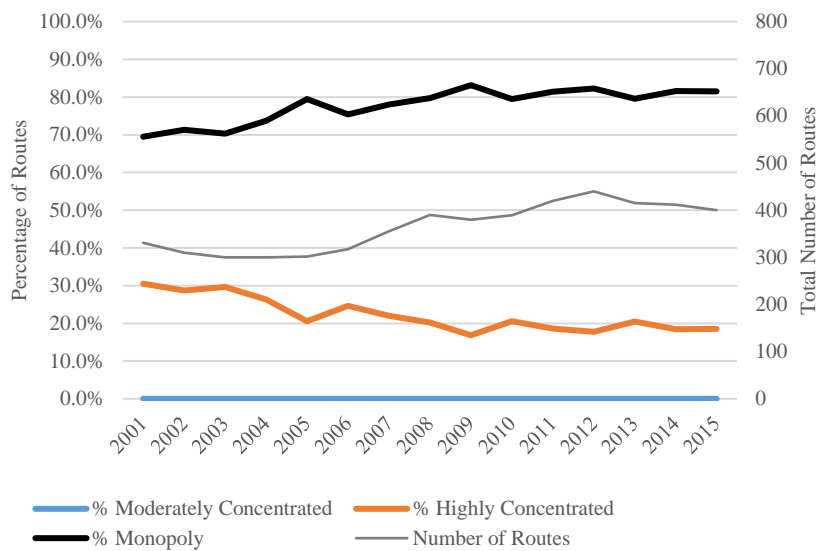


Source: Author’s calculations based on data by diio (2016).

### *Competition in sub-Saharan intercontinental routes*

Even as the total number of intercontinental routes has risen from a low of 300 in 2003/2004 to a high of 440 in 2012, the share of routes in a monopolized state has risen from 69.5 per cent in 2001 to 81.5 per cent in 2015 (Figure 18). This implies relatively thinly travelled routes, where airlines may not see fit to compete with another market entrant on a given route. There is not much divergence in the pattern—the percentage of Sub-Saharan intercontinental routes that are a monopoly has steadfastly been above 70 per cent.

Figure 18: Percentage of routes by market concentration, intercontinental with sub-Saharan Africa, and the total number of routes

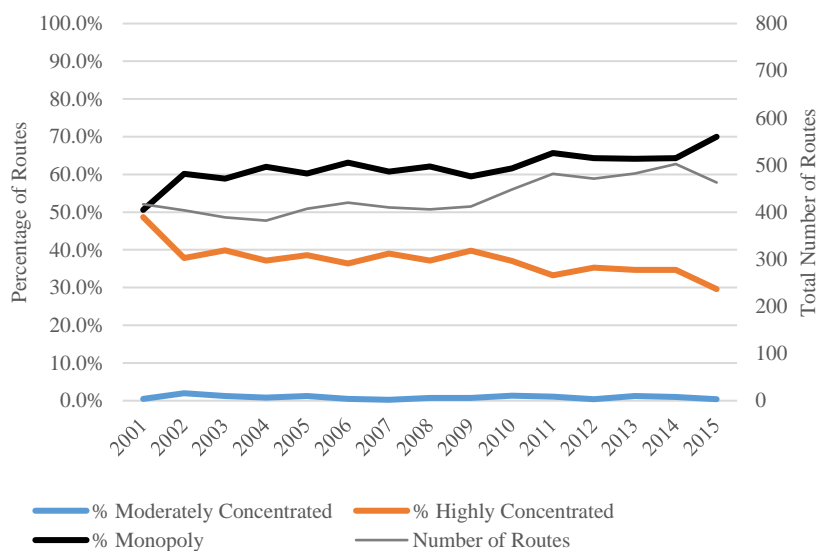


Source: Author's calculations based on data by diio (2016).

*Competition in international routes within sub-Saharan Africa*

Competitiveness in international routes within sub-Saharan Africa was in a dead heat between routes with only one carrier and highly concentrated, but not monopolized routes in 2001. Since then, single-carrier routes have gained, rising from 51 per cent of routes to 70 per cent of routes in 2015 (Figure 19). A very similar pattern evolved with international routes within North Africa.

Figure 19: Percentage of routes by market concentration, international travel within sub-Saharan Africa, and the total number of routes



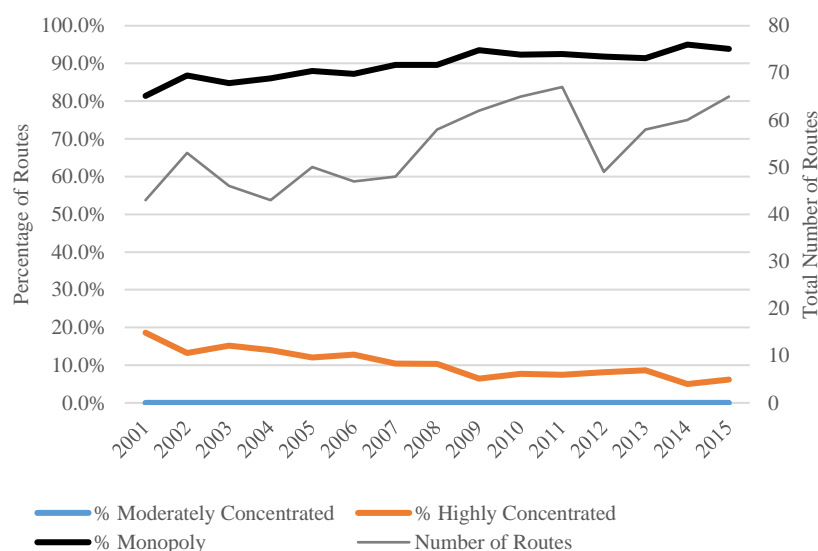
Source: Author's calculations based on data by diio (2016).



### Competition in international routes between NA and SSA

The international routes between north and sub-Saharan Africa feature the least competition, and the highest percentage shares of monopolies. Royal Air Maroc and Egypt Air combined hold 77.3 per cent of this market in seat kilometres, with other competitors being minor. Over 90 per cent of routes are a monopoly (Figure 20).

Figure 20: Percentage of routes by market concentration, international travel between North and sub-Saharan Africa, and the total number of routes

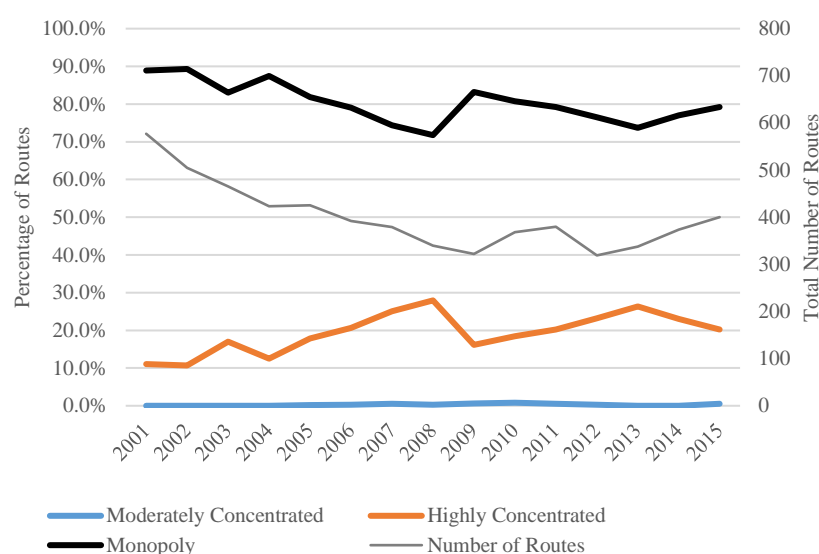


Source: Author's calculations based on data by diio (2016).

### Competition in domestic routes within SSA

Between 2001 and 2009, as the number of routes served declined from 577 to 322, competitiveness actually increased, with 90 per cent of routes being monopolies falling to 72 per cent in 2008, and 11 per cent of being highly concentrated rising to 28 per cent in 2008 (Figure 21). A reversal took place in the oncoming of the global slowdown, and between 2008 and 2009 competitiveness trended downwards, followed by a mild recovery that lasted until 2013. The trend is now towards further consolidation.

Figure 21: Percentage of routes by market concentration, domestic travel within sub-Saharan Africa, and the total number of routes



Source: Author's calculations based on data by diio (2016).

*Possible causes for the overall concentration in African air transport markets*

Overall, African markets suffer from very low volumes. There are only three truly competing Sub-Saharan carriers providing viable international services within Africa: Kenya Airways, South African Airways, and Ethiopian Airlines. Many of the routes flown are not sustainable by themselves: only by introducing fifth freedom ‘round robin’ flights can load factors reach sustainable levels. An indicator of the density of traffic can be seen in the number of runways at key airports: only OR Tambo International Airport in Johannesburg has two parallel runways, while Nairobi’s Jomo Kenyatta International Airport does not even have a parallel taxiway for the entire length of the runway. In another perspective, of the 328 international and intercontinental airport pairs served in 2015, only 57 had over 100,000 seats, approximately the viable breakpoint at which competition enters the market. The number of monopolized routes decreases with the number of estimated seats, the seats being an indicator of the market size (Table 18).

Table 18: Number of international routes with monopolies by estimated seats per route

Route estimated seats	Routes with HH=1 (monopoly)	No. of total routes	Share of routes with monopolies
<100,000	200	271	73.8%
>=100,000 and < 200,000	11	36	30.6%
>= 200,000 and < 400,000	2	13	15.4%
>= 400,000 and < 1,000,000	0	8	0.0%

Source: Author's calculations based on data by diio (2016).

The question of why air transport demand is so low on these routes could be a factor of costs, or perhaps protectionism does play a role. However, most likely the low demand represents the overall weakness of the economies involved: Senegal’s Senegal Airlines attempted to build a cross-regional network in West Africa by throwing high-quality capacity at the market (several Airbus A-320s on leases), but the overall effort failed significantly, with only operators flying small turboprops being able to sustain service.

Though liberalization is not equally implemented in sub-Saharan Africa, the overall framework Ethiopian Airlines invokes when negotiating with potential partner countries is centred around the

Yamoussoukro Decision. The 17 Sub-Saharan countries not served by Ethiopian Airlines are mostly islands, smaller states, or not densely populated (Table 19). This would further support the notion that the lack of service or competition for service in Sub-Saharan countries is no longer a function of restrictions of access (protectionism), but rather lack of demand based on other economic factors.

Table 19: Sub-Saharan countries not served by Ethiopian Airlines in 2015

Country
Cape Verde
Comoros
Eritrea
Guinea
Guinea-Bissau
Liberia
Madagascar
Mauritania
Mauritius
Namibia
Réunion Island
Sao Tome and Principe
Sierra Leone
Swaziland
Gambia
Lesotho
Central African Republic

Source: Author's presentation based on data by diio (2016).

*The role of the private sector in airline ownership*

A common refrain amongst economists and consultants is that airlines should not be owned by governments, but be owned and operated by the private sector. The US and the EU are held up as models for how the industry should function. Many smaller countries, though, pride themselves in having a national flag carrier that represents the country in air transport. Often the marketing towards tourism is cited as a reason.

*Travel & Leisure* annually ranks the best airlines according to their quality of service. The magazine also ranks the worst airlines in terms of service. The 2016 lists are interesting, because the top four 'worst' airlines (Table 21) are privately owned in highly competitive domestic markets, while the top four best airlines are all government-owned flag carriers (Table 20). When advised not to reinvest in a failing flag carrier, and to move towards private sector participation, a counterargument by policymakers is 'but why, look at the success of Ethiopian, Singapore, or Emirates', which are all state-owned flag carriers.

Table 20: 10 best service airlines in the world in 2016

Rank	Airline	Ownership	Notes
1	Singapore	Majority government	Top for over 20 years
2	Emirates	Government	
3	Qatar	Government	
4	Etihad	Government	
5	Virgin Atlantic	Private	
6	Cathay Pacific	Private	
7	Air New Zealand	Privatized 1989	
8	Eva Air	Mostly Private	
9	Korean Air	Privatized 1969	
10	Porter Airlines	Private	

Source: Author's presentation based on *Travel & Leisure* (2016a).

Table 21: 9 worst service airlines in the world in 2016

Rank	Airline	Ownership	Notes
1	Spirit	Private	Domestic service
2	Allegiant	Private	Domestic service
3	Frontier	Private	Domestic service
4	EasyJet	Private	Domestic service
5	Royal Air Maroc	Government	International service
6	Volaris	Private	International service
7	EgyptAir	Government	International service
8	Air India	Government	International service
9	United	Private	Domestic service

Source: Author's presentation based on *Travel & Leisure* (2016b).

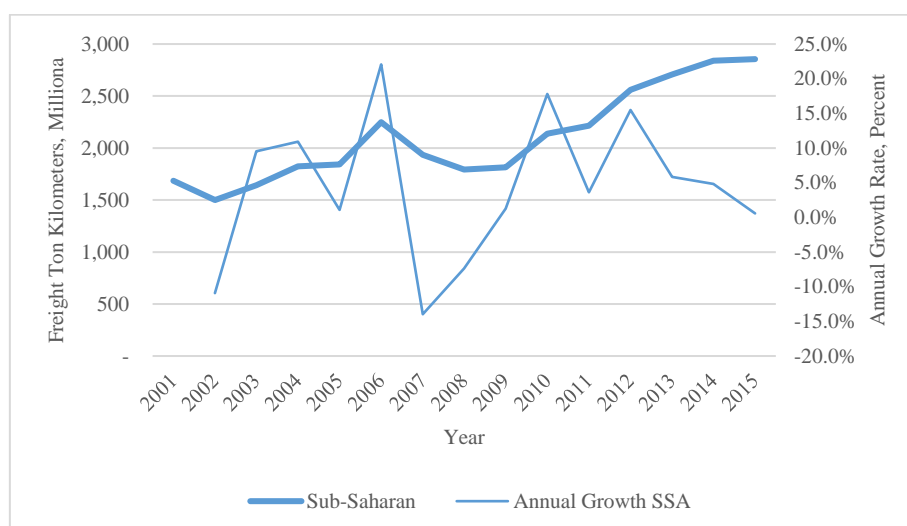
There are, however, many reasons why airlines succeed or fail, and both private sector and publicly owned airlines do both. In an open system with publicly owned airlines there is price competition, and though you may see airlines fail, the consumer benefits through lower prices. In closed, monopolized systems there is no competition, prices may be higher, and an airline may still fail if there are (a) no economies of scale and (b) no management of the airline in a truly commercial framework, as is often the case.

## 2.5 Air freight

### *Statistical overview, sub-Saharan Africa*

The air freight market, as measured in ton kilometres, has grown from roughly 1,800 million to nearly 2,900 million between 2008 and 2015 (Figure 22). As expected, the global slowdown is reflected between 2006 and 2008 (air cargo tends to be a leading indicator). The most recent data shows a slowdown of growth to about 0.5 per cent, significantly down from the post recession recovery, where annual growth was as high as 17.8 per cent between 2009 and 2010.

Figure 22: Air freight ton kilometres, and annual growth rates



Source: Author's chart based on World Bank (2017).

Ethiopian Airlines has followed an aggressive strategy in expansion, and the freight ton kilometres for Ethiopia show the results (Table 22). Both Kenya and Ethiopia have horticultural (cut flowers) exports, which mean long-haul flights to Europe.

Table 22: Top 25 countries in air freight ton kilometres in sub-Saharan Africa

Rank	Country	2001 freight tons (millions)	2007 freight tons (millions)	2015 freight tons (millions)	Share 2015	Annual Growth 2007–15	Annual Growth 2001–15
1	Ethiopia	79.2230	160.3220	1,228.7383	43.0%	29.0%	21.6%
2	South Africa	755.5160	939.1990	885.2780	31.0%	-0.7%	1.1%
3	Kenya	92.7320	298.0830	286.4147	10.0%	-0.5%	8.4%
4	Mauritius	174.2260	202.8140	168.7730	5.9%	-2.3%	-0.2%
5	Zambia	0.0280	-	79.0928	2.8%	-	76.4%
6	Angola	50.8180	72.8880	46.0430	1.6%	-5.6%	-0.7%
7	Madagascar	10.2060	23.9410	30.5126	1.1%	3.1%	8.1%
8	Namibia	74.7440	-	30.3024	1.1%	-	-6.2%
9	Nigeria	2.7920	10.0360	22.4007	0.8%	10.6%	16.0%
10	Rwanda	-	-	21.3829	0.7%	-	-
11	Seychelles	22.0090	27.6440	19.2350	0.7%	-4.4%	-1.0%
12	Sudan	32.6480	45.8920	13.1616	0.5%	-14.5%	-6.3%
13	Mozambique	6.8850	5.7780	5.1389	0.2%	-1.5%	-2.1%
14	Ivory Coast (Cote d'Ivoire)	7.3640	-	4.7191	0.2%	-	-3.1%
15	Senegal	7.3640	-	3.0955	0.1%	-	-6.0%
	Subtotal	1,316.5550	1,786.5970	2,844.2885	99.6%	6.0%	5.7%
	Others	360.3350	147.8300	10.4668	0.4%	-28.2%	-22.3%
	Total	1,676.8900	1,934.4270	2,854.7554	100.0%	5.0%	3.9%

Source: Author's presentation based on World Bank (2017).

#### *Description of the air freight market in north and sub-Saharan Africa*

Unlike the passenger market in air transport, the air freight market is difficult to quantify and analyse, in part because there are different variations of service within the air freight market, and also because of the lack of publicly available data.

A large portion of air freight (between 30 per cent and 50 per cent by weight globally) travels within the bellies of passenger jets, along with checked luggage. The capacity to transport this

freight is deeply dependent on passenger flights. Air freight in general is considered to be more liberalized in terms of movements between countries and allowing routes, including fifth freedom routes. However, though the limitations on air freight theoretically are less, belly capacity realistically places a larger portion of air freight into the same realm as passenger services, which generally tend to be less liberalized. This affects the belly capacity for air freight travelling within Africa.

Scheduled cargo services are hard to measure statistically, since markets are highly competitive, and keeping route data and current and potential clients confidential is a necessary *modus operandi* in the air cargo industry. A true understanding of the industry, therefore, needs incorporation of anecdotal evidence, and also an understanding of the underlying sources of demand.

The sector can be described as having three variations in implementation:

- Belly cargo for within and intercontinental freight transport: perishable exports such as cut flowers may be loaded into the bellies of wide-bodied passenger planes leaving Nairobi or Addis Ababa for, say, Europe, where they are brought to purchasers.
- Dedicated scheduled cargo flights, either from carriers having both passenger services or being strictly cargo, may on a regular basis jump from country to country (fifth freedom flights), using dedicated cargo aircraft.
- Random charters or industry-specific flights might be undertaken, on a less formal basis, to export cargo such as mineral products or perishable food products, with chartered dedicated cargo aircraft. These flights can be with normally operated airports (see Box 2), or can be bush flights, as is the case in remote mining operations such as in Congo, DRC.

Africa's air freight in the past has mostly been in the third variation above: with minimal industrial exports, the largest bulk of air freight exports were perishables with Europe (Boeing 2015: 33). The markets vary in their state of development: Kenya's flower exports are well studied, and the industry can now be considered well established. Similar attempts are now being made in Mwanza, Tanzania. Ethiopia is building its flower exports. Critical factors for success are the underlying infrastructure in getting cut flowers to the airport: Kenya's flower-growing region (Lake Naivasha, 90 km north-west of Nairobi) is well connected by road to Kenya's international airport, whereas Ethiopia's flower-growing region in the past has had poor road connectivity to Bole International Airport in Addis Ababa, with a 40 per cent spoilage rate.

## Box 2: Chartered Air Cargo Services in Mwanza, Tanzania

Mwanza is a city located at the southernmost tip of Lake Victoria. The lake has an active fishing and fish export industry: though locals prefer the consumption of local Tilapia, the introduced West Nile Perch sell well both in Europe and the United States.

The fish are caught by local fishermen and brought for sale to one of several fish factories—enterprises that specialize in cleaning the fish, trimming the fish into filets, packaging the filets for export, and then exporting the filets. Frozen exports usually go overseas by vessel; ‘fresh’ (in a nearly frozen state) need to be shipped by air.

Generally, it is not the factory that arranges for air transport, but rather the buyer. This means that if an order of fresh fish is being placed, the order is filled by the fish factory, and the buyer charters for a cargo aircraft to be at Mwanza’s airport at a specified time. The fish factory is only aware of the pickup time, all other arrangements, such as costs for the shipment, are unknown to the factory.

The fish factory loads the product onto refrigerated trucks and goes to the waiting aircraft. No cold storage is involved: until loading of the aircraft, the fish factory remains in total control of the product, by preference.

If aircraft scheduling does not succeed, the fish are trucked to Nairobi for shipment by air.

The logs of shipments kept for customs purposes at the airport are hand-written. Collecting data, therefore, on ad hoc charter services, important as they economically may be, is difficult. The air shipments are asymmetrical—the aircraft is only being flown into Mwanza for picking up fish.<sup>5</sup>

Source: Author visits and interviews on site.

### 3 Safety oversight

Air safety in Africa has been one of the aviation industry’s biggest concerns. For years, Africa ranked the worst in jet hull losses and other types of safety measures. A rash of eight serious accidents between 2002 and 2009 (23) put aviation safety in Africa into the spotlight: of those eight accidents, four were in Nigeria, and a concerted effort began to bring safety issues under control, including a World Bank programme for increasing effective oversight in several countries in West Africa.

Table 23: Accidents in sub-Saharan Africa between 2002 and 2012 with significant loss of life

Date	Country	Aircraft type	Fatalities	Probable cause
2002: 4 May	Nigeria	BAC 1-11	149	Suspected engine failure
2003: 8 July	Sudan	Boeing 737	116	Loss of control after engine failure
2003: 25 December	Benin	Boeing 727	141	Overloaded aircraft
2005: 22 October	Nigeria	Boeing 737	117	Poor procedures, lack of oversight
2005: 10 December	Nigeria	DC-9	108	Pilot error
2006: 29 October	Nigeria	Boeing 737	96	Wind shear
2007: 5 May	Cameroon	Boeing 737	114	Spatial disorientation& loss of control
2009: 30 June	Comoros	A 310	152	Loss of control
2012: 12 June	Nigeria	DC-9	153	Dual engine failure

Source: Compiled from Aviation Safety Network (2017).

<sup>5</sup> An Austrian-produced documentary named ‘Darwin’s Nightmare’ describes the trips to Mwanza, in this case by Russian cargo carriers, as not being asymmetrical, claiming an underground weapons trade is associated with these flights. However, on visits to Mwanza airport by the author, no Russian cargo carriers were observed.

The list of recent accidents found in Table 23 only shows the accidents with the highest fatalities. However, there were many others that resulted in loss of life or equipment.

The causes for the high rate of accidents and fatalities are numerous. For several years African countries became a favourite destination for older soviet-made aircraft, and aircraft age (also by western manufacturers) and overall quality became an issue. The old aircraft 'dumping' onto Africa also reflected a basic lack of capacity by, and independence of, regulatory agencies that often fell under political influence. A potential operator would use political influence, for example, to have an older cargo aircraft certified for commercial use even though the aircraft would never pass properly enforced safety inspections.

ICAO's Universal Safety Oversight Audit Programme (USOAP) provides a yardstick with which countries can be measured comparatively with respect to their implementation of aviation safety standards and recommended practices. The audit also issues alerts when a country's regulatory oversight is so poor that safety concerns are significant. Four out of the globally eight countries flagged as such are sub-Saharan African, namely Angola, Djibouti, Eritrea, and Malawi. Overall 15 Sub-Saharan countries have deficits in meeting global averages in implementation of all eight categories being measured (Table 24). What is important in understanding USOAP averages is that these global averages (a) are just averages of implementation and *below* the optimal level of implementation and (b) as averages, are mathematically pulled lower by poor performers.

Three other global safety assessment programmes exist that have a significant impact. Beyond ICAO's USOAP, there is the US FAA's International Aviation Safety Assessment (IASA) programme, which also audits safety oversight in countries, the IATA Operational Safety Audit (IOSA) registry, which audits individual airlines' safety mechanisms, and the EU blacklist, which bans either countries or individual airlines from countries from entering the EU.

The FAA's IASA programme is comprehensive in that it does not audit specific airlines, but rather the regulatory oversight system of countries. A country that wishes to fly into the US is required to complete this audit, and pass the audit results in the coveted 'Category 1' rating, while failing results in 'Category 2'. To date there are only four Sub-Saharan countries that carry the Category 1 rating: Ethiopia, South Africa, Cape Verde, and recently (as of 2010) Nigeria.

IATA requires all member airlines to pass the IOSA, after which the passing airline appears on the IATA registry. Currently there are 31 Sub-Saharan airlines on the registry, including the major carriers (Ethiopian Airlines, Kenya Airways, and South African Airways).

The EU blacklist is unique in two aspects. The list works by country, airline, and even specific aircraft, where for example all aircraft from a mentioned airline may be banned from the EU except for one or two with specific registry numbers. The list also mentions airlines that do not fly into the EU, and have no intention to fly into the EU: the list intends to warn European nationals about what airlines to avoid when travelling abroad. In 2012, the list contained 284 airlines, of which 130 were African, and 24 countries, of which 17 were African (Ohaeri 2012). The list of 12 August 2016 still includes 24 countries, of which 15 are Sub-Saharan (European Union 2016).

The silver lining in the cloud is that the shock of the series of accidents between 2005 and 2006 in Nigeria resulted in significant changes in the leadership of Nigeria's civil aviation authority. On 23 April 2010 Nigeria received the coveted Category 1 rating by the US FAA. In 2012, the African Union signed the Abuja Declaration on Aviation Safety in Africa, which is now being implemented in cooperation with IATA.



Table 24: Countries in sub-Saharan Africa with less than global average implementation of ICAO standards and recommended practices in each of the audited topics

Country	Legislation	Organization	Licensing	Operations	Airworthiness	Accident investigation	Air navigation services	Aerodromes	Year of audit
Burundi	x	x	x	x	x	x	x	x	2013
Central African Republic	x	x	x	x	x	x	x	x	2007
Chad	x	x	x	x	x	x	x	x	2015
Congo DRC	x	x	x	x	x	x	x	x	2014
Djibouti	x	x	x	x	x	x	x	x	2008
Eritrea	x	x	x	x	x	x	x	x	2010
Gabon	x	x	x	x	x	x	x	x	2012
Guinea	x	x	x	x	x	x	x	x	2014
Lesotho	x	x	x	x	x	x	x	x	2007
Liberia	x	x	x	x	x	x	x	x	2006
Malawi	x	x	x	x	x	x	x	x	2009
Sao Tome & Principe	x	x	x	x	x	x	x	x	2014
Sierra Leone	x	x	x	x	x	x	x	x	2015
Swaziland	x	x	x	x	x	x	x	x	2015
Tanzania	x	x	x	x	x	x	x	x	2013
Comoros	x	x	x	x	x	x	x	x	2008
Congo		x	x			x	x	x	2015
Namibia		x	x	x	x		x		2016
Rwanda	x		x			x	x	x	2012
Angola			x			x	x	x	2015
Benin			x	x		x		x	2015
Burkina Faso			x	x	x		x		2014
Cameroun	x	x				x		x	2015
Madagascar			x	x		x		x	2015
Togo			x	x	x		x		2016
Uganda	x		x	x			x		2014
Ghana				x	x		x		2006
Mozambique	x	x			x				2014
Senegal			x			x	x		2014
Zambia						x	x	x	2016
Zimbabwe			x	x			x		2013
Mauritius						x	x		2015
Niger			x	x					2015
South Africa		x				x			2013
Botswana								x	2015
Cabo Verde							x		2009
Ethiopia				x					2015
Gambia, The				x					2005
Kenya						x			2013
Mali								x	2015
Sudan							x		2014
Mauritania									2014

Source: Compiled from ICAO (2017).

#### 4 Policy recommendations

Three significant challenges face the aviation sector in sub-Saharan Africa: Aviation safety (a reflection of institutional oversight), non-sustainable national flag carriers, and expensive infrastructure investments that overestimate demand and fail to recognize the key functions of airports. Policy makers should be fully aware of where the separation of private sector service provision and public infrastructure should occur. Three general policy recommendations are:

**1) Aviation safety cannot be compromised for any short-term economic gain or interim policy objective.**

Trust in safety is key for developing the air transport sector. This is not just because of statistical implications: air transport accidents and crashes garner significant attention in the media, and tend to appear dramatic. Precisely because they are such rare occurrences, crashes are particularly visible. Preventing accidents requires a rigorous institutional approach in implementing international standards and recommended practices. Regulators, airport authorities, and airlines should be institutionally separated and have clear firewalls between them.

**2) Small, state-owned flag carriers tend to drain state funds, are not sustainable, hinder the sector from developing, and often even pose a safety hazard.**

There is a list of about-to-be defunct and actually defunct small flag carriers that have accumulated extensive losses for their treasuries. Airlines appear, some survive, and some fail, and the private sector should assume this risk. An open system with competition will assure that carriers will provide service—socially desired and unsustainable route servicing should be accomplished with subsidies that are transparently granted after a competitive bidding process, not by state-owned carriers that are most likely to make losses on all routes, be they sustainable or not. Government intervention and ownership of assets should only occur in expensive infrastructure projects that in their own nature are a monopoly, not in service provision.

**3) Airport investment should be done carefully, keeping in mind that most airports serve as gateways, not as hubs, and that creating a hub requires players who desire a hub.**

Three notions need to be kept in mind when looking at airport investments:

- a) Airports are, by their very nature, monopolistic. This implies that airport infrastructure will most likely be owned by governments. But airports are also complex systems: there is, for example, no shortage of runways in Africa given the current traffic levels. However, terminal space can run out as traffic grows, and terminals can be developed with private sector participation. It is becoming more and more common for governments without the capital reserves to invest in new terminals to use PPP concessions to finance new investments.
- b) Many countries dream of developing passenger or logistics hubs at the airports, often spurred on by hearing news that a neighbouring country has the same plans. The fact is that there can only be so many hubs globally, and most likely the airport in question really serves as an all-important gateway. A properly run gateway that is effective and efficient will serve the business and tourism industry, and may, over time, become a hub if an airline decides to base its passenger transfer operations there. However, the most important function of airports in most countries is to connect the country with the outside world. This must remain the primary objective.
- c) In Africa, new airport development is often financed through very high ticket surcharges. These have the effect of reducing traffic and demand. If a US\$400 ticket has a US\$80 to US\$100 airport development surcharge, the extra 25 per cent added to the ticket price will have a dampening effect. Very often a new airport is not even

needed, and the real drawback to the current installation remains with the current terminal. A careful balance needs to be reached in airport master planning that balances true infrastructure needs with both publicly and privately available investment capital and takes into account the elasticity of final ticket prices.

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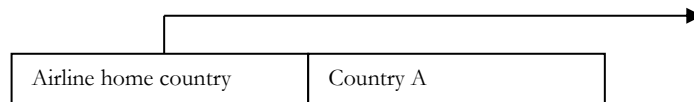
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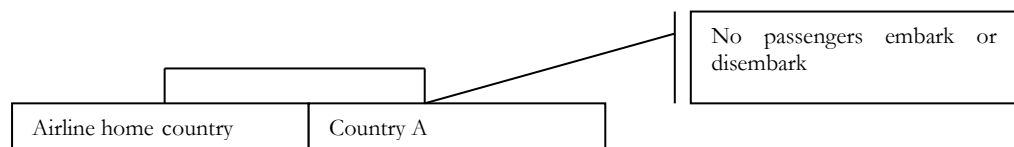
## Appendix 1: Freedoms of the air

ICAO defines nine ‘freedoms of the air’, which are one of the components found in (usually bilateral) air services agreements forged between countries. The first five are internationally recognized by treaty, whereas ICAO calls the last four concept ‘so-called freedoms of the air’.

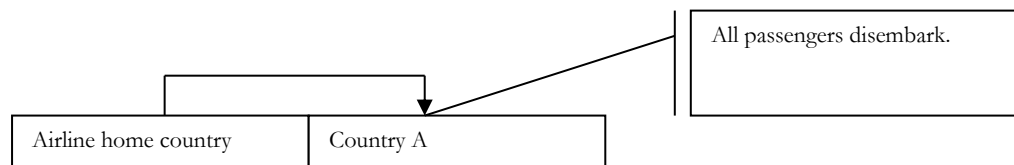
(1) First freedom of the air: airline of home country can overfly another country (country A).



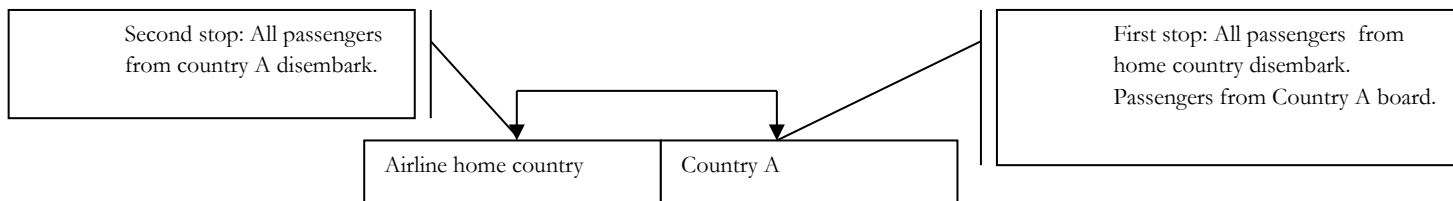
(2) Second freedom of the air: airline of home country can do a technical stop for fuel, maintenance, supplies, etc. in another country (country A).



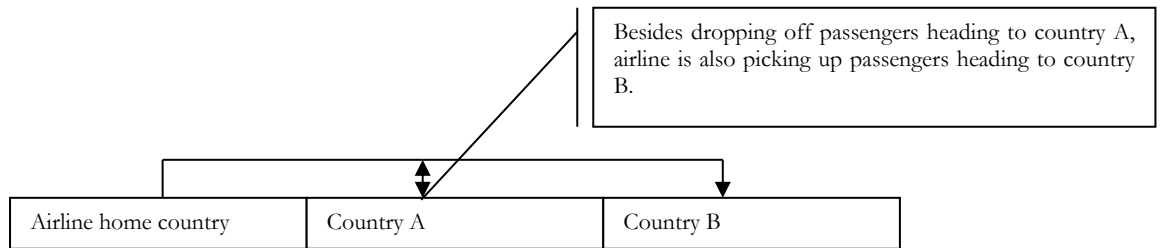
(3) Third freedom of the air: airline of home country can land in another country (country A) to drop off passengers from home country.



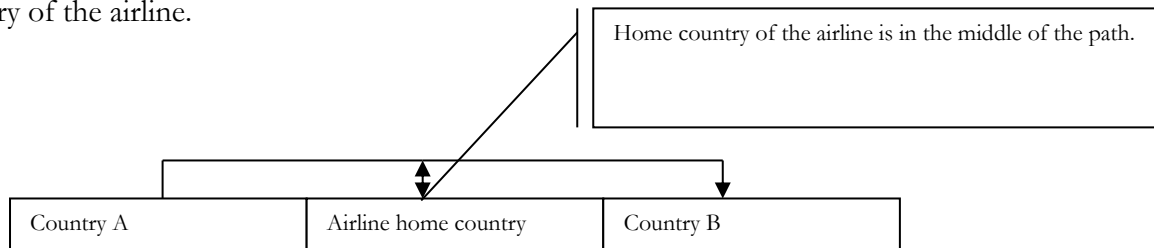
(4) Fourth freedom of the air: Airline of home country can land in another country (country A) to drop off passengers from home country and pick up passengers from country A going to home country.



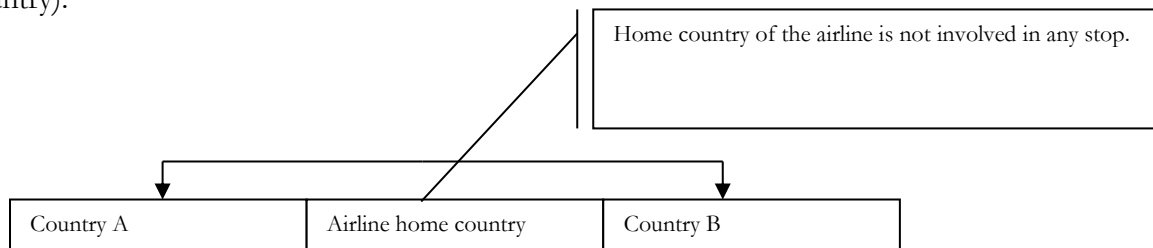
(5) Fifth freedom of the air: airline of home country can pick up and drop off passengers in Country A, with some passengers boarding in country A going to a third country C. The caveat is that this is an ongoing operation originating (or terminating) in the home country.



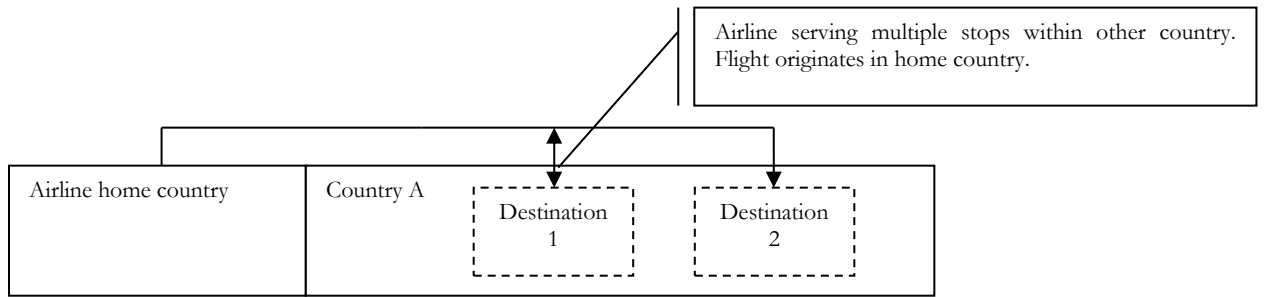
(6) So-called sixth freedom of the air: traffic originates (or terminates) outside home country (say country A), and goes to (or comes from) a second country (say country B) via a stop at the home country of the airline.



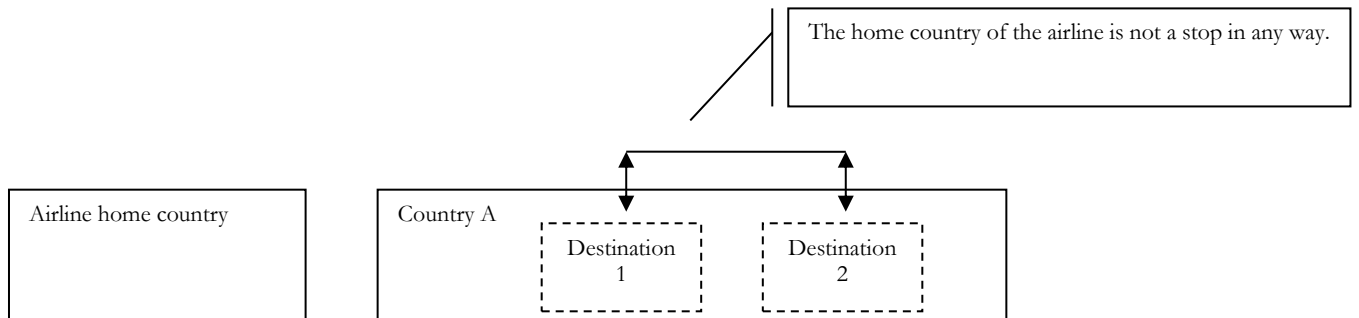
(7) So-called seventh freedom of the air: airline from home country can travel between country A and country B without the home country being in the path (that is, no leg stops in the home country).



(8) So-called eighth freedom of the air: airline from home country can serve several destinations in other country A in one flight, both picking up and dropping off passengers, as long as the flight originates or terminates in home country.



(9) So-called ninth freedom of the air, also referred to as 'cabotage': airline from home country serves domestic stops within other country, without the home country being part of the flight. Cabotage is not commonly found.



## Appendix 2: List of airlines serving sub-Saharan Africa, 2001–15

The following table shows airlines with scheduled services in Africa in descending order by seat/km flown. The same table is also subsequently presented in alphabetical order.

Table A2.1: List of airlines serving sub-Saharan Africa, in descending order of seat kilometres

Rank	Name	Seat/km (10 millions of)		
		2001	2007	2015
1	Ethiopian Airlines	40.19	118.24	356.82
2	Emirates	17.16	110.29	326.78
3	South African Airways	337.95	325.33	286.10
4	Air France	135.51	182.43	235.65
5	British Airways	196.74	158.89	150.10
6	Kenya Airways	50.47	107.08	143.66
7	KLM	59.92	93.97	106.38
8	Turkish Airlines	4.19	5.92	89.86
9	Delta Air Lines		29.51	79.59
10	Air Mauritius	72.56	85.48	79.31
11	Lufthansa	31.66	58.43	72.36
12	Qatar Airways	1.12	23.50	67.25
13	Comair Ltd		39.05	64.17
14	CORSAIR	18.35	27.84	58.45
15	TAAG – Linhas Aereas de Angola	13.16	23.88	54.08
16	Air Austral	3.95	39.19	52.58
17	Royal Air Maroc	4.48	26.12	49.90
18	Arik Air		4.56	45.48
19	Brussels Airlines N.V.	29.44	23.11	44.29
20	TAP – Air Portugal	14.29	31.35	39.78
21	Virgin Atlantic Airways	30.23	51.41	35.94
22	Egyptair	9.94	24.18	34.44
23	Mango Airlines		5.48	34.16
24	Etihad Airways	0.26	10.23	28.18
25	Qantas Airways	20.36	22.48	27.30
26	Cathay Pacific Airways	14.13	24.27	26.26
27	Condor	10.83	13.27	21.98
28	Air Namibia (Pty) Ltd	13.43	23.48	21.83
29	Singapore Airlines	21.38	26.71	21.48
30	Flydubai			20.44
31	SWISS		28.29	20.38
32	Sudan Airways Co Ltd	15.49	13.53	20.33
33	Saudia (Saudi Arabian Airlines)	9.50	10.08	19.53
34	Equatorial Congo Airlines (ECAIR)			16.92
35	Air Madagascar	15.74	19.64	15.79
36	SA Airlink dba South African Airlink		9.20	15.61
37	South African Airways Express dba Congo Express		3.39	15.42
38	United Airlines			14.83
39	Iberia	13.30	18.69	13.94
40	Thomsonfly			13.60
41	Jet Airways (India)			13.38
42	Safair (Propietary) Ltd.			12.11
43	Transportes Aereos de Cabo Verde	5.77	12.01	12.00
44	RwandAir Limited		1.57	11.66
45	LAM - Linhas Aereas De Mocambi	5.48	3.28	11.27
46	Lauda Air			11.26
47	Air Italy S.p.A		1.22	11.25
48	Air Arabia	0.85	1.16	9.84
49	TUIfly Gmbh		1.36	9.57
50	XL Airways France			8.62
51	Fly 540 Tanzania Ltd			8.15
52	China Southern Airlines		11.85	7.45
53	Cameroon Airlines Corporation dba Camair-Co		1.06	7.23



54	Air Algerie	1.95	2.20	5.76
55	Tunis Air	0.42	4.03	5.76
56	ASKY			5.38
57	Middle East Airlines	2.50	3.91	5.31
58	Dana Airlines Limited			4.67
59	Air Seychelles	16.42	19.25	4.67
60	Air China			4.35
61	Oman Air (SAOG)			4.09
62	El Al	3.92	4.35	4.06
63	Braathens			3.73
64	Tarco Airways			3.57
65	National Air Services - Al Khalaya			3.36
66	Air Zimbabwe	13.69	16.44	3.31
67	Sahara Air Cargo Limited SFQ			3.18
68	Gulf Air	6.55	2.82	3.15
69	Mauritanian Airlines International			2.94
70	Afriqiyah Airways	0.67	7.07	2.87
71	Jetairfly - TUI Airlines Belgium			2.69
72	Precision Air Services Ltd	0.47	1.58	2.68
73	Air Botswana Corporation	1.62	2.03	2.41
74	Trans Air Congo (TAC)		1.31	2.34
75	TUfly			2.31
76	Senegal Airlines			2.29
77	Thomas Cook Airlines UK Limited			2.22
78	Woodgate Executive Air Charter UK Ltd.=Euromanx			2.19
79	Arkefly, TUI Airlines Nederland B.V.			2.12
80	TUfly Nordic AB		1.46	2.08
81	Vueling Airlines			2.03
82	Jubba Airways			2.00
83	Macair Jet S.A.			1.98
84	Five Forty Aviation Limited			1.97
85	Air Burkina	0.24	2.12	1.89
86	Aigle Azur		0.07	1.81
87	Star Air Cargo Pty Ltd			1.43
88	Daallo Airlines	1.57	4.28	1.38
89	Royal Jordanian		0.91	1.23
90	East African Safari Air Express Ltd.			1.22
91	Skywise			1.09
92	Cirrus Airlines Luftfahrtgesellschaft mbh			1.09
93	African Express Airways (K) Ltd.		0.90	1.02
94	HMY Airways, Inc. dba Harmony Airways			1.01
95	Africa World Airlines			1.00
96	Air Bashkortostan Ltd.			0.99
97	Air Nostrum			0.94
98	Alitalia	7.73	9.80	0.93
99	Yemenia Yemen Airways	3.02	3.94	0.93
100	Safarilink Aviation			0.85
101	STP Airways			0.81
102	Buffalo Airways Ltd.			0.77
103	Proflight Commuter Services LTD		0.10	0.77
104	Air Europa		1.02	0.69
105	Antrak Air Limited		0.40	0.54
106	Cemair			0.51
107	Austrian Airlines	1.85	0.48	0.48
108	Europe Airpost			0.47
109	AirKenya Express Ltd.			0.45
110	FirstNation Airways Limited			0.45
111	Luxair			0.44
112	Dolphin Air			0.41
113	Cronos Airlines			0.38
114	NOVA Airways			0.38
115	Inter-Aviation Services dba Interair South Africa	1.46	1.30	0.37
116	Transavia France			0.34
117	Air Luxor GB. Lda			0.31

118	Transavia Airlines			0.30
119	PrivatAir			0.30
120	Webjet Linhas Aereas S/A			0.28
121	Eurocypria Airlines Ltd.			0.28
122	Al-Naser Airlines			0.26
123	Czech Connect Airlines a.s.			0.25
124	Travel Service Slovakia			0.25
125	Nile Air			0.22
126	Alpine Air Pvt. Ltd.			0.21
127	AlMasria Universal Airlines			0.20
128	Czech Airlines			0.17
129	Israir Airlines and Tourism Ltd.			0.17
130	ZanAir Limited	0.19		0.16
131	USA 3000 Airlines			0.15
132	Cronos Airlines			0.14
133	AB Aviation			0.12
134	Aviacon Zitotrans Air Company JSC			0.10
135	Equaflight Service			0.07
136	Batavia Air - PT Metro Batavia			0.05
137	Benin Golf Air S.A.	0.29		0.05
138	Navegacion y Servicios Aereos Canarios, S.A. (NAYSA)			0.04
139	Canary Fly S.A.			0.03
140	Eagle Air Ltd.	0.11	0.13	0.02
141	Binter Canarias			0.02
142	Federal Airlines (Pty) Ltd		0.77	0.02
143	SNCF			0.01
144	Felix Airways			0.00
145	Air Cairo	6.86	22.76	
146	LTU	8.68	21.70	
147	Air Nigeria Development Limited		20.24	
148	1time Airline		15.66	
149	African Star Airways		14.89	
150	Malaysia Airlines	10.05	11.45	
151	Air Senegal International	1.65	11.24	
152	Bora Jet Havacilik tasimacilik Ueak		10.48	
153	North American Airlines		9.04	
154	Bellview Airlines Ltd.	3.23	7.73	
155	Thai Airways		7.46	
156	Olympic Air	4.90	6.54	
157	Asian Air Airline		6.30	
158	Ghana International Airlines		6.14	
159	Anguilla Air Services Ltd.	0.78	6.10	
160	China Eastern Airlines		5.92	
161	Chanchangi Airlines Nigeria Limited		5.17	
162	flyCongo	1.53	5.00	
163	Eritrean Airlines		4.48	
164	Cameroon Airlines	15.26	4.22	
165	MAT Airways Ltd.		4.02	
166	CDI Cargo Airlines Limited		3.66	
167	Societe Nouvelle Air Ivoire		3.57	
168	CAI SECOND		3.08	
169	bmi		3.02	
170	Air Tanzania Company Ltd.	3.59	2.93	
171	Air India	3.58	2.79	
172	Aero Contractors Nigeria Limited		2.62	
173	Mongolian Airlines Group LLC	1.06	2.33	
174	SALSA d'Haiti		2.00	
175	Kannithi Aviation Company Limited dba Kan Air		1.96	
176	Spanair	1.56	1.95	
177	Astraeus Ltd.		1.90	
178	Air Malawi Limited	2.07	1.75	
179	Livingston S.p.A.		1.46	
180	Martinair		1.39	
181	First Choice Airways Limited		1.27	

182	Starlight Airline	1.63	1.23
183	Hahn Air Lines		1.13
184	FlyGlobespan	1.53	1.13
185	Hainan Airlines		0.96
186	Djibouti Airlines	0.50	0.95
187	Exec Air Inc. of Naples	0.85	0.89
188	Slok Air International		0.81
189	Marsland Aviation Co		0.70
190	IBL Aviation dba Catovair		0.67
191	Jubba Airways		0.66
192	Nasair		0.66
193	Syrian Arab Airlines	0.65	0.64
194	Blue Panorama Airlines S.p.A		0.52
195	Interlink Aviation (PTY) Ltd.		0.51
196	Jet Link Express		0.42
197	Futura International Airways		0.33
198	Star Equatorial Airlines		0.27
199	Wimbi Dira Airways		0.26
200	Aeroflot	1.85	0.20
201	Aviation Starlink	0.01	0.20
202	Spring Airlines Limited Corporation		0.12
203	Overland Airways Limited		0.05
204	Gambia International Airlines Ltd.	0.34	0.04
205	Air Burundi	0.06	0.02
206	Region-Airline	45.13	
207	Swiss Air Transport	29.87	
208	Globus LLC	23.71	
209	PT. Wings Abadi Airlines	12.89	
210	Air Gabon	11.29	
211	LAN Argentina	8.21	
212	Linkair Express	5.74	
213	Wasaya Airways	4.77	
214	Axis Airways	3.83	
215	Jin Air Company	1.77	
216	Libyan Airlines	1.54	
217	Airline Utair Ukraine	1.26	
218	Safi Airways Ltd	1.25	
219	Sichuan Airlines	1.00	
220	Jazeera Airways	0.80	
221	Zoom Airlines	0.63	
222	Belle Air Europe	0.38	
223	BH Air Ltd.	0.32	
224	National Air Cargo Group Inc. dba National Airlines (aka Murray Air)	0.30	
225	RusLine, JSAC	0.29	
226	Ghadames Air Transport	0.26	
227	Menajet	0.25	
228	Concesionaria Vuela Compania de SA de CV (Volaris)	0.23	
229	Heli Securite Helicopter Airlines	0.12	
230	Viking Airlines AB	0.08	
231	Titan Airways Limited	0.07	
232	Easyjet Switzerland S.A.	0.06	
233	Compania Aerea Viajes Guinea Airlines	0.04	
234	Servicio Aereo a Territorios Nacionales (SATENA)	0.02	
235	Kunming Airlines	0.02	
236	Nac Aviation Business Centre	0.02	

Source: Author's calculations based on data provided by diio (2016).

Table A2.2: List of airlines serving sub-Saharan Africa, in alphabetical order

Rank	Name	Seat/km (10 millions of)		
		2001	2007	2015
148	1time Airline		15.66	
133	AB Aviation			0.12
172	Aero Contractors Nigeria Limited		2.62	
200	Aeroflot	1.85	0.20	
95	Africa World Airlines			1.00
93	African Express Airways (K) Ltd.		0.90	1.02
149	African Star Airways		14.89	
70	Afriqiyah Airways	0.67	7.07	2.87
86	Aigle Azur		0.07	1.81
54	Air Algerie	1.95	2.20	5.76
48	Air Arabia	0.85	1.16	9.84
16	Air Austral	3.95	39.19	52.58
96	Air Bashkortostan Ltd.			0.99
73	Air Botswana Corporation	1.62	2.03	2.41
85	Air Burkina	0.24	2.12	1.89
205	Air Burundi	0.06	0.02	
145	Air Cairo	6.86	22.76	
60	Air China			4.35
104	Air Europa		1.02	0.69
4	Air France	135.51	182.43	235.65
210	Air Gabon	11.29		
171	Air India	3.58	2.79	
47	Air Italy S.p.A		1.22	11.25
117	Air Luxor GB. Lda			0.31
35	Air Madagascar	15.74	19.64	15.79
178	Air Malawi Limited	2.07	1.75	
10	Air Mauritius	72.56	85.48	79.31
28	Air Namibia (Pty) Ltd.	13.43	23.48	21.83
147	Air Nigeria Development Limited		20.24	
97	Air Nostrum			0.94
151	Air Senegal International	1.65	11.24	
59	Air Seychelles	16.42	19.25	4.67
170	Air Tanzania Company Ltd.	3.59	2.93	
66	Air Zimbabwe	13.69	16.44	3.31
109	AirKenya Express Ltd.			0.45
217	Airline Utair Ukraine	1.26		
98	Alitalia	7.73	9.80	0.93
127	AlMasria Universal Airlines			0.20
122	Al-Naser Airlines			0.26
126	Alpine Air Pvt. Ltd.			0.21
159	Anguilla Air Services Ltd.	0.78	6.10	
105	Antrak Air Limited		0.40	0.54
18	Arik Air		4.56	45.48
79	Arkefly, TUI Airlines Nederland B.V.			2.12
157	Asian Air Airline		6.30	
56	ASKY			5.38
177	Astraeus Ltd.		1.90	
107	Austrian Airlines	1.85	0.48	0.48
134	Aviacon Zitotrans Air Company JSC			0.10
201	Aviation Starlink	0.01	0.20	
214	Axis Airways	3.83		
136	Batavia Air - PT Metro Batavia			0.05
222	Belle Air Europe	0.38		
154	Bellview Airlines Ltd.	3.23	7.73	
137	Benin Golf Air S.A.		0.29	0.05
223	BH Air Ltd.	0.32		
141	Binter Canarias			0.02
194	Blue Panorama Airlines S.p.A		0.52	
169	bmi		3.02	
152	Bora Jet Havacilik tasimacilik Ueak		10.48	

63	Braathens			3.73
5	British Airways	196.74	158.89	150.10
19	Brussels Airlines N.V.	29.44	23.11	44.29
102	Buffalo Airways Ltd.			0.77
168	CAI SECOND		3.08	
164	Cameroon Airlines	15.26	4.22	
53	Cameroon Airlines Corporation dba Camair-Co		1.06	7.23
139	Canary Fly S.A.			0.03
26	Cathay Pacific Airways	14.13	24.27	26.26
166	CDI Cargo Airlines Limited		3.66	
106	Cemair			0.51
161	Chanchangi Airlines Nigeria Limited		5.17	
160	China Eastern Airlines		5.92	
52	China Southern Airlines		11.85	7.45
92	Cirrus Airlines Luftfahrtgesellschaft mbh			1.09
13	Comair Ltd.		39.05	64.17
233	Compania Aerea Viajes Guinea Airlines	0.04		
228	Concesionaria Vuela Compania de SA de CV (Volaris)	0.23		
27	Condor	10.83	13.27	21.98
14	CORSAIR	18.35	27.84	58.45
113	Cronos Airlines			0.38
132	Cronos Airlines			0.14
128	Czech Airlines			0.17
123	Czech Connect Airlines a.s.			0.25
88	Daallo Airlines	1.57	4.28	1.38
58	Dana Airlines Limited			4.67
9	Delta Air Lines		29.51	79.59
186	Djibouti Airlines	0.50	0.95	
112	Dolphin Air			0.41
140	Eagle Air Ltd.	0.11	0.13	0.02
90	East African Safari Air Express Ltd.			1.22
232	Easyjet Switzerland S.A.	0.06		
22	Egyptair	9.94	24.18	34.44
62	El Al	3.92	4.35	4.06
2	Emirates	17.16	110.29	326.78
135	Equaflight Service			0.07
34	Equatorial Congo Airlines (ECAIR)			16.92
163	Eritrean Airlines		4.48	
1	Ethiopian Airlines	40.19	118.24	356.82
24	Etihad Airways	0.26	10.23	28.18
121	Eurocypria Airlines Ltd.			0.28
108	Europe Airpost			0.47
187	Exec Air Inc. of Naples	0.85	0.89	
142	Federal Airlines (Pty) Ltd		0.77	0.02
144	Felix Airways			0.00
181	First Choice Airways Limited		1.27	
110	FirstNation Airways Limited			0.45
84	Five Forty Aviation Limited			1.97
51	Fly 540 Tanzania Ltd			8.15
162	flyCongo	1.53	5.00	
30	Flydubai			20.44
184	FlyGlobespan	1.53	1.13	
197	Futura International Airways		0.33	
204	Gambia International Airlines Ltd.	0.34	0.04	
226	Ghadames Air Transport	0.26		
158	Ghana International Airlines		6.14	
208	Globus LLC	23.71		
68	Gulf Air	6.55	2.82	3.15
183	Hahn Air Lines		1.13	
185	Hainan Airlines		0.96	
229	Heli Securite Helicopter Airlines	0.12		
94	HMY Airways, Inc. dba Harmony Airways			1.01
39	Iberia	13.30	18.69	13.94
190	IBL Aviation dba Catovair		0.67	

115	Inter-Aviation Services dba Interair South Africa	1.46	1.30	0.37
195	Interlink Aviation (PTY) Ltd.		0.51	
129	Israir Airlines and Tourism Ltd.			0.17
220	Jazeera Airways	0.80		
41	Jet Airways (India)			13.38
196	Jet Link Express		0.42	
71	Jetairfly - TUI Airlines Belgium			2.69
215	Jin Air Company	1.77		
82	Jubba Airways			2.00
191	Jubba Airways		0.66	
175	Kannithi Aviation Company Limited dba Kan Air		1.96	
6	Kenya Airways	50.47	107.08	143.66
7	KLM	59.92	93.97	106.38
235	Kunming Airlines	0.02		
45	LAM - Linhas Aereas De Mocambi	5.48	3.28	11.27
211	LAN Argentina	8.21		
46	Lauda Air			11.26
216	Libyan Airlines	1.54		
212	Linkair Express	5.74		
179	Livingston S.p.A.		1.46	
146	LTU	8.68	21.70	
11	Lufthansa	31.66	58.43	72.36
111	Luxair			0.44
83	Macair Jet S.A.			1.98
150	Malaysia Airlines	10.05	11.45	
23	Mango Airlines		5.48	34.16
189	Marsland Aviation Co		0.70	
180	Martinair		1.39	
165	MAT Airways Ltd.		4.02	
69	Mauritanian Airlines International			2.94
227	Menajet	0.25		
57	Middle East Airlines	2.50	3.91	5.31
173	Mongolian Airlines Group LLC	1.06	2.33	
236	Nac Aviation Business Centre	0.02		
192	Nasair		0.66	
224	National Air Cargo Group Inc. dba National Airlines (aka Murray Air)	0.30		
65	National Air Services - Al Khalaya			3.36
138	Navegacion y Servicios Aereos Canarios, S.A. (NAYSA)			0.04
125	Nile Air			0.22
153	North American Airlines		9.04	
114	NOVA Airways			0.38
156	Olympic Air	4.90	6.54	
61	Oman Air (SAOG)			4.09
203	Overland Airways Limited		0.05	
72	Precision Air Services Ltd	0.47	1.58	2.68
119	PrivatAir			0.30
103	Proflight Commuter Services LTD		0.10	0.77
209	PT. Wings Abadi Airlines	12.89		
25	Qantas Airways	20.36	22.48	27.30
12	Qatar Airways	1.12	23.50	67.25
206	Region-Airline	45.13		
17	Royal Air Maroc	4.48	26.12	49.90
89	Royal Jordanian		0.91	1.23
225	RusLine, JSAC	0.29		
44	RwandAir Limited		1.57	11.66
36	SA Airlink dba South African Airlin		9.20	15.61
42	Safair (Propietary) Ltd.			12.11
100	Safarilink Aviation			0.85
218	Safi Airways Ltd	1.25		
67	Sahara Air Cargo Limited SFQ			3.18
174	SALSA d'Haiti		2.00	
33	Saudia (Saudi Arabian Airlines)	9.50	10.08	19.53
76	Senegal Airlines			2.29
234	Servicio Aereo a Territorios Nacionales (SATENA)	0.02		

219	Sichuan Airlines	1.00		
29	Singapore Airlines	21.38	26.71	21.48
91	Skywise			1.09
188	Slok Air International		0.81	
143	SNCF			0.01
167	Societe Nouvelle Air Ivoire		3.57	
3	South African Airways	337.95	325.33	286.10
37	South African Airways Express dba Congo Express		3.39	15.42
176	Spanair	1.56	1.95	
202	Spring Airlines Limited Corporation		0.12	
87	Star Air Cargo Pty Ltd			1.43
198	Star Equatorial Airlines		0.27	
182	Starlight Airline	1.63	1.23	
101	STP Airways			0.81
32	Sudan Airways Co. Ltd.	15.49	13.53	20.33
31	SWISS		28.29	20.38
207	Swiss Air Transport	29.87		
193	Syrian Arab Airlines	0.65	0.64	
15	TAAG - Linhas Aereas de Angola	13.16	23.88	54.08
20	TAP - Air Portugal	14.29	31.35	39.78
64	Tarco Airways			3.57
155	Thai Airways		7.46	
77	Thomas Cook Airlines UK Limited			2.22
40	Thomsonfly			13.60
231	Titan Airways Limited	0.07		
74	Trans Air Congo (TAC)		1.31	2.34
118	Transavia Airlines			0.30
116	Transavia France			0.34
43	Transportes Aereos de Cabo Verde	5.77	12.01	12.00
124	Travel Service Slovakia			0.25
75	TUIfly			2.31
49	TUIfly Gmbh		1.36	9.57
80	TUIfly Nordic AB		1.46	2.08
55	Tunis Air	0.42	4.03	5.76
8	Turkish Airlines	4.19	5.92	89.86
38	United Airlines			14.83
131	USA 3000 Airlines			0.15
230	Viking Airlines AB	0.08		
21	Virgin Atlantic Airways	30.23	51.41	35.94
81	Vueling Airlines			2.03
213	Wasaya Airways	4.77		
120	Webjet Linhas Aereas S/A			0.28
199	Wimbi Dira Airways		0.26	
78	Woodgate Executive Air Charter UK Ltd.=Euromanx			2.19
50	XL Airways France			8.62
99	Yemenia Yemen Airways	3.02	3.94	0.93
130	ZanAir Limited		0.19	0.16
221	Zoom Airlines	0.63		

Source: Author's calculations based on data provided by diio (2016).