

---

## Aviation Safety in South Sudan

**Ayiei Garang Deng Ayiei**

School of Engineering, RMIT University, Melbourne 3000, Australia



---

**ABSTRACT:** Africa contributes only 3.9% in air traffic, but records 19% of aviation accidents, in terms of fatalities. High accident rates are attributed to poor compliance with International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPs). This study analyzed the prevalence of aircraft accidents in the youngest African country, South Sudan, which obtained independence in July 9, 2011. The quantitative study examined aviation accident databases to determine the number of aircraft accidents in South Sudan, the aircraft manufacturers and aircraft models, number of fatalities, and causes of accidents, categorized as pilot error, technical failure, air traffic control, or weather-related events. The accidents were collected from the Aviation Safety Network (ASN) database, which is maintained by the Flight Safety Foundation. A total of 83 accident cases were examined, with 32 satisfying the criteria of accidents covering the July 2011 to May 2021 period. The findings show that Antonov aircrafts account for a majority of the accidents (31.25%), followed by Cessna (21.88%) and LET (15.63%). The 32 aircrafts involved in the accidents were carrying 378 occupants, 72 occupants died, representing a fatality rate of 19.5%. Antonov (66.67%) and LET (27.7%) contributed the greatest fatalities. In terms of accident causes, technical failures (46.9%) and pilot errors (43.8%) were the most dominant causes. Weather-related conditions only contributed to 9.4% of all the cases investigated. These results show that South Sudan continues to suffer from poor aviation infrastructure, poor compliance to internationally recognized SARPs.

**KEYWORDS:** Aviation safety, accident types, fatality rates

---

### 1. INTRODUCTION

Aviation is vital for socioeconomic development, international trade, tourism and regional integration. This is particularly integral in Africa due to the size of the continent and the vast physical barriers such as deserts, mountains and tropical forests, as well as the poor land-based transport networks. Africa is an underserved continent, despite being the second largest continent in size, with 16% of the world's population, it accounts for only 3% of global air traffic. The Airports Council International (ACI) predicts that the aviation industry will grow by 3.9% in 2020, higher than the global average of 3.4%, with cargo growth recording 5.9% growth in 2020. These growth rates situate Africa as one of the fastest-growing aviation regions, with annual growth rate predicted at 5.1% over the next 20 years (Shila & Anne, 2015). On the contrary, while Africa accounts for only 3% of world traffic, it contributes 19% of accidents. In general, accident rates have been decreasing in other parts of the world, but studies show that aircraft accidents in Africa have steadily increased over the past 10 years. High accident rates are attributed to poor compliance with International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPs). The obligation of ensuring that national civil aviation operations comply with SARPs lies with individual member states (EU, 2017).

According to the African Civil Aviation Commission (AFCAC) safety is the highest priority for all involved in aviation. African states face a myriad of challenges in effectively and efficiently implementing and monitoring safety objectives and targets at the national level and regional level. (AFCAC, 2018). Decades of conflict in Sudan destroyed the aviation infrastructure. At time the Comprehensive Peace Agreement, which put in place the mechanisms for the independence of South Sudan, was signed in 2005 and led to the eventual separation of South Sudan from Khartoum on July 9 2011, the aviation infrastructure was disenfranchised. The independence of South Sudan meant that the aviation infrastructure remained under the control of the north, and what remained in the south was left to decay. Khartoum withdrew nearly all air traffic control, making air transportation of security personnel, peacekeeping personnel, and humanitarian aid precarious (AFCAC, 2018).

## Aviation Safety in South Sudan

The scope of the problem increased when, in the run up to the independence celebration and all rules governing international aviation were suspended, air control services (ATC) for upper airspace were suspended. When 80 heads of state and senior delegations were planning to travel to Juba on July 9 to celebrate the independence of the new country, they realized that there was no ATC, no marginal facilities, no weather observations, no contingency plans, and no ability to coordinate flight plans or diversions with neighboring countries. As a result, U.S. State Department, together with other partners, such as neighboring countries, provided financial support to the Flight Safety Foundation and ICAO to establish the South Sudan Aviation Development. The West African Air Navigation Service Provider, ASECNA, provided the technical assistance in repairing and replacing critical communication infrastructure with the capability of providing direct ACT support while also training ATC personnel. The technical assistance established new ATC radios, repaired navigation facilities, installed weather observation equipment, created new ATC procedures, and established special local procedures to handle the VIP flights scheduled for independence celebrations. ICAO also set up a regional office to guide agreements with adjacent states and ensure the new procedures complied with international rules, while also ensuring that the upper airspace was open to allow uninterrupted navigation across the continent (EU, 2017). These developments laid the foundation for the evolution of aviation and aviation safety in South Sudan.

## 2. LITERATURE REVIEW

Understanding the major causes of air accidents is prerequisite to determining the actions that need to be taken to reduce the occurrence and losses to lives and property. Africa has consistently held the poorest safety record when compared to all regions. A study of the 1996 to 2000 reported accident rates of 3.6%, with that covering 2001 to 2005 recording a 5% accident rate per million departures. In comparison, the United States recorded 0.7% and 0.4% over the same period (Air Safety Week, 2007). In a 2013 analysis, Africa accounted for 20% of all aviation accidents and fatalities (Pasztor, 2014). Other scholars have estimated that on average, Africa contributes 19% of all aviation accidents, and has consistently ranked Africa as the region with the worst safety record by The Universal Safety Oversight Audit Program (USOAP) (Shila & Anne, 2015). The poor safety record is attributed to a complex mix of social, economic and political factors, ranging from corruption, to poor economies, to political conflicts that hinder the implementation of better infrastructure, safety regulations, and cooperation among member states of ICAO and IATA (Boehmer, 2013).

Graham (2013) carried out an analysis to determine the status of aviation safety in Africa. Ministers across Africa met in Abuja and established the Abuja Ministerial Targets which sought to progressively reduce accident rates in Africa, in line with the global trends; reduce run-way related accidents by 50%; and reduce controlled flight into terrain (CFIT) related accidents by 50% by 2015. The 2013 analysis showed that the continent was heading in the right direction as far as these targets were concerned, with fifteen countries achieving the targets: Egypt, South Africa, Gambia, Kenya, Tunisia, Mauritania, Sudan, Nigeria, Ethiopia, Cape Verde, Morocco, Ghana, Togo, Mauritius, and Zimbabwe (Graham, 2013).

Shila and Anne (2015) carried out a study on air accidents in Africa between 2004 and 2014. The data was obtained from the Aviation Safety Database which is maintained by the Flight Safety Foundation. Statistical analyses focused on determining the differences in causes of air accidents based on the type and age of aircraft. The causes were categorized as pilot error, technical failure, weather and others, the latter including terrorism, air traffic control, and crew actions. Out of the 132 accidents analyzed, 32% were reported in the Democratic Republic of Congo, 25% in Sudan, 19% in Southern Sudan, 9% in Kenya, 8% in Tanzania. A majority of the accidents were caused by technical failures (30%), pilot errors (28%), weather-related events (10%), while the cause could not be ascertained in 32% of the cases. The main aircrafts associated with the accidents were Russian made aircrafts such as Antonov and Ilyushin (54%), while American aircrafts Cessna and Boeing were associated with 32% of the accidents and European made aircrafts were linked to 14% of the cases. The 132 accidents led to the death of 1204 aircraft occupants and 72 deaths on the grounds.

Mwikya and Mulwa (2018) investigated the implementation of aviation safety standards and performance in Kenya. The researchers observed that Kenya has been experiencing an increased number of air accidents, involving helicopters and light aircrafts. The Ministry of Transport noted that that aircraft accidents continue to rise even though the Kenya Civil Aviation Authority has improved safety oversight, thanks to support from the United States Federal Aviation Administration through the Safe Sky for Africa initiative. The researchers carried out a conceptual study to review issues affecting safety and performance. The review established that the aircraft operational performance was influenced by individual carrier issues, weather events, and air traffic control decisions. Further, there have been challenges in effective implementation of critical elements associated with safety oversight systems and poor adherence to safety-related ICAO SARPs. Other risks that have impacted negatively on aviation safety included terrorist scares and attacks. Poor infrastructure was also cited as a major contributor to aviation safety issues in Kenya. In conclusion, the study proposed that aviation

## Aviation Safety in South Sudan

safety in Kenya was mainly influenced by aviation training, effective monitoring of aviation personnel and certification, aviation infrastructure, and aviation data management (Mwikya & Mulwa, 2018).

### 3. METHODOLOGY

The quantitative study examined aviation accident databases to determine the number of aircraft accidents in South Sudan, the aircraft manufacturers and aircraft models, number of fatalities, and causes of accidents, categorized as pilot error, technical failure, air traffic control, or weather-related events. The accidents were collected from the Aviation Safety Network (ASN) database, which is maintained by the Flight Safety Foundation. The data covers both the pre-independence and post-independence periods, but the study will focus on the period after South Sudan gained independence on June 9, 2011.

### 4. RESULTS

#### 4.1. Duration

The Aviation Safety Database contains 83 accidents from April 1947 to August 2021, covering both pre-independence period and post-independence period. From the analysis, 60.98% (50) accidents were recorded in the pre-independence period, while 39.02% (32) accidents were recorded in the post-independence period.

**Table 1: Duration of accidents**

<i>Duration</i>	<i>Number of aircraft accidents (%)</i>
Pre-independence (April 1947-June 2011)	32 (39.02%)
Post-independence (July 2011 – August 2021)	52 (60.98%)

#### 4.2. Aircraft Types

The main aircraft type associated with accidents in South Sudan were Antonov (models 12bk, 26, 26B, 30A-100, 32A, 74-200), involved in 31.25% of all accidents, with Cessna (models Caravan and Grand Caravan) involved in 21.88% of the accidents. The LET models L-410MA, L-410UVP, and L-410UVP-E9 were involved in 15.63% of the accidents, with Fokker 50 and F27 accounting for 12.50% of all accidents reported. The aircraft manufacturers, Boeing, BAe BAe, and DHC and Hawker Siddely were minimally associated with the accidents. Antonov and Cessna are the dominant aircraft models operating in the South Sudanese region.

**Table 2: Aircraft types involved in accidents**

<i>Aircraft Type</i>	<i>Aircraft Model</i>	<i>Count</i>	<i>Percent</i>
Antonov	An-12BK	1	31.25%
	An-26	3	
	An-26B	3	
	An-30A-100	1	
	An-32A	1	
	An-74-200	1	
BAe Bae	748-371 Srs. 2B LFD	2	6.25%
Boeing	737-58E	1	3.13%
Cessna	208B Caravan	1	21.88%
	208B Grand Caravan	6	
DHC-8-402Q	Dash 8	1	3.13%
Fokker	50	3	12.50%
	F27	1	
Hawker Siddely	HS-748	1	6.25%
	HS-780 Andover C.1	1	
LET	L-410MA	1	15.63%

## Aviation Safety in South Sudan

	L-410UVP	2	
	L-410UVP-E9	2	
Total		32	100.00%

### 4.3. Fatalities

ASN reported 33 accidents over the 2011 to 2021 period. The total number of occupants (crew and passengers) was 388, and 83 occupants died in the accidents, representing a fatality rate of 20.5%. A majority of the fatalities (68.67%) were reported in Antonov aircrafts manufactured in Russia and LET aircrafts manufactured in the Czech Republic (27.78%). A few fatalities were also reported in accidents involving Boeing (2.78%), BAe BAe (1.39%) and Cessna (1.39%) aircrafts.

**Table 3: Accident fatalities**

Aircraft Type	Fatalities	
	Count	Percent
Antonov	48	66.67%
BAe Bae	2	2.78%
Boeing	2	2.78%
Cessna	1	1.39%
LET	20	27.78%
Total	72	100.00%

### 4.4. Accident Causes

The main cause of aircraft accidents in Sudan was technical failures, accounting for 46.9% of the cases, followed by pilot errors at 43.8%. Weather-related conditions only contributed to 9.4% of all the cases investigated. The data from ASN only provides observational reports and not accident investigation reports. As such, they only offer preliminary understanding of the potential causes of the accidents. Nonetheless, it is possible to infer the probable cause from the observational reports.

**Table 4: Accident causes**

Accident causes	Count	Percent
Pilot errors	14	43.750%
Technical failures	17	60.875%
Weather	3	9.375%
Total	32	100.00%

## 5. CONCLUSION

South Sudan is the poster child of poor aviation safety in Africa. The fatality rates of 19% are way above the global average. Owing to lack of aviation infrastructure, the country's airspace is home to some of the oldest Russian made aircrafts such as Antonov and LET models. However, South Sudan is a young country and still has time to streamline its aviation oversight and regulations. Decades of military conflicts before independence and after independence remain a major obstacle in the development of aviation infrastructure and compliance to International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPs). It remains the responsibility of the South Sudanese government to strengthen national civil aviation operations to comply with SARPs.

## REFERENCES

- 1) AFCAC. (2018). Mechanism for Monitoring Implementation of Safety Systems & Initiatives. African Civil Aviation Commission (AFCAC).
- 2) Air Safety Week. (2007). Improving Aviation Safety in Africa. Air Safety Week, 21(36).
- 3) Boehmer, J. (2013). Africa: Land of Aviation Opportunities and Obstacles. Business Travel, 30(18), 21.

## Aviation Safety in South Sudan

- 4) EU. (2017). Action Document for EU-Africa Safety in Aviation. The Commission Implementing Decision on the Annual Action Programme 2017 of the DCI Pan-African Programme, European Union.
- 5) Graham, N. (2013). Status of Aviation Safety in Africa. International Civil Aviation Organization.
- 6) Mwikya, N. K., & Mulwa, S. A. (2018). Implementation of Aviation Safety Standards and Performance of Air Transport Industry: A Conceptual Perspective. *African Journal of Business and Management*, 4(2), 20-33.
- 7) Pasztor, A. (2014). African Air Safety Record Trails the Rest of the World. *Wall Street Journal*. Retrieved from <http://www.wsj.com/articles/SB10001424052702304887104579302904075115883>
- 8) Shila, J. J., & Anne, A. (2015). Promoting Aviation Safety in Africa; Analysis of Air Accidents in the Region between 2004 and 2013. 18th International Symposium on Aviation Psychology, (pp. 43-48). Retrieved from [https://corescholar.libraries.wright.edu/isap\\_2015/100](https://corescholar.libraries.wright.edu/isap_2015/100)