AIRCRAFT SERIOUS INCIDENT REPORT AND EXECUTIVE SUMMARY

			Reference:		CA18/3/2/1367		
Aircraft Registration	ZS-ALJ, ZS-CMG	**Date of Incident**	23 August 2021		**Time of Incident**	0545Z	
Type of Aircraft	Embraer EMB-135KL, Bombardier CL-600-2B19		**Type of Operation**		Air Transport Operations (Part 121)		
Pilot-in-command Licence Types	Airline Transport Pilot Licence (Both Pilots)		**Ages**	30; 65	**Licences Valid**	Yes	
Pilot-in-command Flying Experience		**Total Flying Hours**		4 815.0; 17 884.7	**Hours on Type**	2 262.0; 7 259.6	
Last Point of Departure	Cape Town International Aerodrome (FACT), Western Cape (ZS-ALJ) George Aerodrome (FAGG), Western Cape (ZS-CMG)						
Next Point of Intended Landing	George Aerodrome (FAGG), Western Cape (ZS-ALJ) O.R. Tambo International Aerodrome (FAOR), Gauteng (ZS-CMG)						
Damage to Aircraft	Neither of the aircraft sustained damage						

Location of the incident site with reference to easily defined geographical points (GPS readings if possible)

In George, ZS-ALJ on approach for Runway 11 and ZS-CMG taking off from Runway 29

Meteorological Information	Surface wind; 350°/4kt, temperature; 16°C, visibility; +10km, CAVOK						
Number of People On-board	3 + 28; 3 + 38	**Number of People Injured**	0	**Number of People Killed**	0	**Other (On Ground)**	0

Synopsis

On Monday morning, 23 August 2021, an Embraer EMB-135KL aircraft with registration ZS-ALJ and flight number Link621 was on a scheduled flight from Cape Town International Aerodrome (FACT) to George Aerodrome (FAGG) in the Western Cape. On-board the aircraft were three crew members and 28 passengers. The aircraft was scheduled for departure at FACT at 0515Z with an estimated flight time of 35 minutes. According to available information, the aircraft took off at 0520Z.

On the same morning, a Bombardier CL-600-2B19 aircraft with registration ZS-CMG and flight number KEM125 was on a scheduled flight from FAGG to O.R. Tambo International Aerodrome (FAOR) in Gauteng province. On-board the aircraft were three crew members and 38 passengers. The flight was scheduled for departure at FAGG at 0545Z. A Notice to Airmen (NOTAM) at FAGG that was issued stated that Approach Control opens at 0530Z and the Tower at 0545Z. The ZS-CMG took off at own discretion from Runway 29 whilst the ZS-ALJ was on approach for Runway 11. Both aircraft were tracked on the secondary surveillance radar (SSR) which showed that the ZS-CMG turned out left shortly after take-off (towards the sea). The ZS-ALJ was instructed by the Approach Controller to turn right (also towards the sea). The closest the two aircraft came near each other was 14 nautical miles (nm).

Probable Cause/s and/or Contributory Factors

The pilot-in-command (PIC) of the ZS-CMG elected to take-off from Runway 29 by following the unmanned aerodrome departure procedures (pilot's discretion) before the tower officially opened at 0545Z. This was after he was advised by the Approach Controller that Runway 11 was in use and that there was an aircraft (ZS-ALJ) inbound for landing from the west. This resulted in the two aircraft being on reciprocal tracks. The Approach Controller instructed the ZS-ALJ aircraft to deviate by turning to the right of the track until they were clear of the departing conflicting traffic.

SRP date	11 October 2022	Publication date	12 October 2022

Occurrence Details

Reference Number	**:** CA18/3/2/1367
Occurrence Category	**:** Category 1
Type of Operation	**:** Air Transport Operations (Part 121)
Name of Operators	**:** Airlink & CemAir
Aircraft Registrations	**:** ZS-ALJ & ZS-CMG
Aircraft Make and Model	**:** Embraer EMB-135KL and Bombardier CL-600-2B19
Nationality	**:** South African
Place	**:** George area, Western Cape Province
Date and Time	**:** 23 August 2021, 0545Z
Injuries	**:** None
Damage	**:** None

Purpose of the Investigation

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 2011, this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and not to apportion blame or liability.

All times given in this report are Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.

Investigation Process

The Accident and Incident Investigations Division (AIID) of the South African Civil Aviation Authority (SACAA) was notified of the occurrence on 23 August 2021 via the ASQS-IQSMS aviation reporting system. The occurrence was categorised as a serious incident according to the CAR 2011 Part 12 and ICAO STD Annex 13 definitions.

Notes:

1. *Whenever the following words are mentioned in this report, they shall mean the following:*
   Serious Incident — this investigated serious incident
   Aircraft — the Embraer EMB-135-KL and Bombardier CL-600-2B19 involved in this serious incident
   Investigation — the investigation into the circumstances of this serious incident
   Pilots — the pilots involved in this serious incident
   Report — this serious incident report

2. *Photos and figures used in this report were taken from different sources and may have been adjusted from the original for the sole purpose of improving clarity of the report. Modifications to images used in this report were limited to cropping, magnification, file compression; or enhancement of colour, brightness, contrast; or addition of text boxes, arrows, or lines.*

Disclaimer

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Abbreviation	Description
°	Degrees
°C	Degrees Celsius
AGL	Above Ground Level
AIID	Accident and Incident Investigations Division
AMO	Aircraft Maintenance Organisation
AMSL	Above Mean Sea Level
AOC	Air Operating Certificate
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATPL	Airline Transport Pilot Licence
CAR	Civil Aviation Regulations
CAVOK	Cloud and Visibility OK
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CPL	Commercial Pilot Licence
CRS	Certificate of Release to Service
CVR	Cockpit Voice Recorder
DFE	Designated Flight Examiner
DME	Distance Measuring Equipment
DVOR	Doppler VHF Omni-directional Range
FACT	Cape Town International Aerodrome (ICAO designation)
FAGG	George Aerodrome (ICAO designation)
FAOR	OR Tambo International Aerodrome (ICAO designation)
FDR	Flight Data Recorder
FL	Flight Level
FO	First Officer
ft	Feet
GPS	Global Positioning System
GRV	Golf Romeo Victor Beacon
hPa	Hectopascal
ICAO	International Civil Aviation Organisation
ILS	Instrument Landing System
Kt	Knots
m	Metres
METAR	Meteorological Aerodrome Report
MHz	Megahertz
MTOW	Maximum Take-off Weight
PAPI	Precision Approach Path Indicators
PIC	Pilot-in-Command
QNH	Barometric Pressure Adjusted to Sea Level
SACAA	South African Civil Aviation Authority
SAWS	South African Weather Service
SSR	Secondary Surveillance Radar
TBO	Time Between Overhaul
TCAS	Traffic Alert and Collision Avoidance System
UTC	Coordinated Universal Time
VCCS	Voice Communication and Control System
VFR	Visual Flight Rules
VHF	Very High Frequency
Z	Zulu (Term for Universal Co-ordinated Time - Zero Hours Greenwich)

FACTUAL INFORMATION

1.1 History of Flight

1.1.1 On Monday morning, 23 August 2021, an Embraer EMB-135KL aircraft with registration ZS-ALJ, flight number Link621, was on a scheduled flight from Cape Town International Aerodrome (FACT) to George Aerodrome (FAGG) in the Western Cape. On-board the aircraft were three crew members and 28 passengers. The aircraft was scheduled for departure at FACT at 0515Z with an estimated flight time of 35 minutes. According to available information, the aircraft took off at 0520Z.

1.1.2 On the same morning, a Bombardier CL-600-2B19 aircraft with registration ZS-CMG, flight number KEM125, was on a scheduled flight from FAGG to FAOR in Gauteng province. On-board the aircraft were three crew members and 38 passengers. The aircraft was scheduled for departure at FAGG at 0545Z. Both aircraft were tracked on the secondary surveillance radar (SSR) (see Figure 3).

1.1.3 A Notice to Airmen (NOTAM) was issued for FAGG which stated that Approach Control at the aerodrome will open at 0530Z and the Tower will open at 0545Z and close at 1700Z from Monday to Friday (see Appendix A). At 05:40:56Z, the ZS-ALJ called George Approach Control on frequency 128.20-Megahertz (MHz) and the aircraft was cleared to descend to flight level (FL) 150 or 15 000 feet (ft) vectors for Instrument Landing System (ILS) Runway 11. The crew read back correctly and requested the aerodrome weather as no automatic terminal information service (ATIS) was available. The Approach Controller indicated that the surface wind was northerly at less than 5 knots, temperature was 6°C, dew point was 4°C, barometric pressure was 1018 hectopascal (hPa) and it was Ceiling and Visibility OK (CAVOK).

1.1.4 At 05:41:28Z, ZS-CMG first officer (FO) broadcasted on the Tower frequency 118.90 MHz that KEM125 (ZS-CMG) was taxiing to holding point Alpha 3 for Runway 29. At 05:42:09Z, the Approach Controller called ZS-CMG, informing them that the Tower frequency will be opening within the next 2 minutes and that there was an aircraft inbound for Runway 11 within the next 7 minutes.

1.1.5 At 05:42:22Z, ZS-CMG requested Runway 29. The Approach Controller informed ZS-CMG to hold position at Alpha 3 holding point. At 05:42:58Z, the Approach Controller instructed ZS-ALJ to descend to 4 500 feet (ft). At 05:43:41Z, the pilot-in-command (PIC) of ZS-CMG called to inform the Approach Controller that they are ready for an immediate take-off. At 05:43:58Z, the Approach Controller informed ZS-CMG that Approach Control was unable to accommodate them as the Tower was closed. At 05:44:02Z, the ZS-CMG PIC informed Approach Controller that they will follow unmanned procedures, taking off from Runway 29,

left-hand out over the sea and climbing overhead to FL100. At 05:44:23Z, the PIC of ZS-CMG broadcasted on the approach frequency: *"George traffic CemAir 125, a CRJ 200, ZS-CMG is lining up Runway 29, we are taking off, it will be an early left-hand turn out climbing overhead the airfield initially to FL100".*

1.1.6 At 05:44:58Z, the Tower Controller advised all traffic that the Tower is now manned. At 05:45:11Z, the Tower Controller again informed all traffic that the Tower was now manned; and at 05:45:39Z, the Tower Controller requested any traffic on frequency 118.9 to please acknowledge.

1.1.7 At 05:45:21Z, ZS-ALJ called Approach Controller, informing them that they have the field in sight for visual approach. Approach Controller responded: "*Link621 I might have to level you off. I am just waiting to see where KEM125 turns, he is lined up at the moment.*" At 05:45:35Z, the PIC of ZS-CMG broadcasted on Approach frequency: *"George traffic unmanned, CemAir 125 is rolling Runway 29 turning out left".* Following this broadcast, the Approach Controller informed ZS-CMG that the Tower was now open.

1.1.8 At 05:45:48Z the Approach Controller instructed ZS-ALJ to "*stop the descent 8 000ft*", which was acknowledged. At 05:47:06Z, ZS-ALJ was instructed by Approach Controller to turn right on a heading of 165° and to descend to 6 000ft. At 05:47:20Z, ZS-CMG called Approach Control, *climbing to 5 000ft heading 210*°. ZS-CMG was instructed to squawk 3271 and to climb to FL150. At 05:47:47Z, ZS-ALJ was instructed to descend to 4 500ft, and 40 seconds later the aircraft was instructed to descend further to 3 500ft. At 05:48:48Z, ZS-ALJ was cleared for visual approach Runway 11 with no further restrictions, and radar control was terminated. The aircraft landed at 05:54:12Z.

1.1.9 According to the radar data, at 05:47:18Z (the radar time stamp for both aircraft) the separation between the two aircraft when measured in a straight line was 17nm (31 kilometres), with ZS-ALJ on final approach for Runway 11 and ZS-CMG taking off from Runway 29. At 05:48:48Z (the radar time stamp for both aircraft) the separation reduced to 14nm (26 kilometres) when ZS-ALJ was instructed by the Approach Controller to turn right on a heading of 165° (towards the sea) and ZS-CMG was already in a left turn also over the sea. At this point, the vertical separation between the aircraft was 100ft, with ZS-ALJ at 7200ft and ZS-CMG at 7300ft. The 14nm separation was the closest the two aircraft came near each other during the incident flight.

1.1.10 Figure 3 shows the ZS-ALJ aircraft flying a straight-in approach for landing Runway 11 whilst under radar control. The aircraft was then instructed to turn right on a heading of 165° which was towards the town of Mossel Bay. At 05:49:23Z, the aircraft commenced with a left turn for visual approach Runway 11. The radar track flown by ZS-CMG displayed the left turn out after take-off from Runway 29, routing over the sea as broadcasted by the PIC.

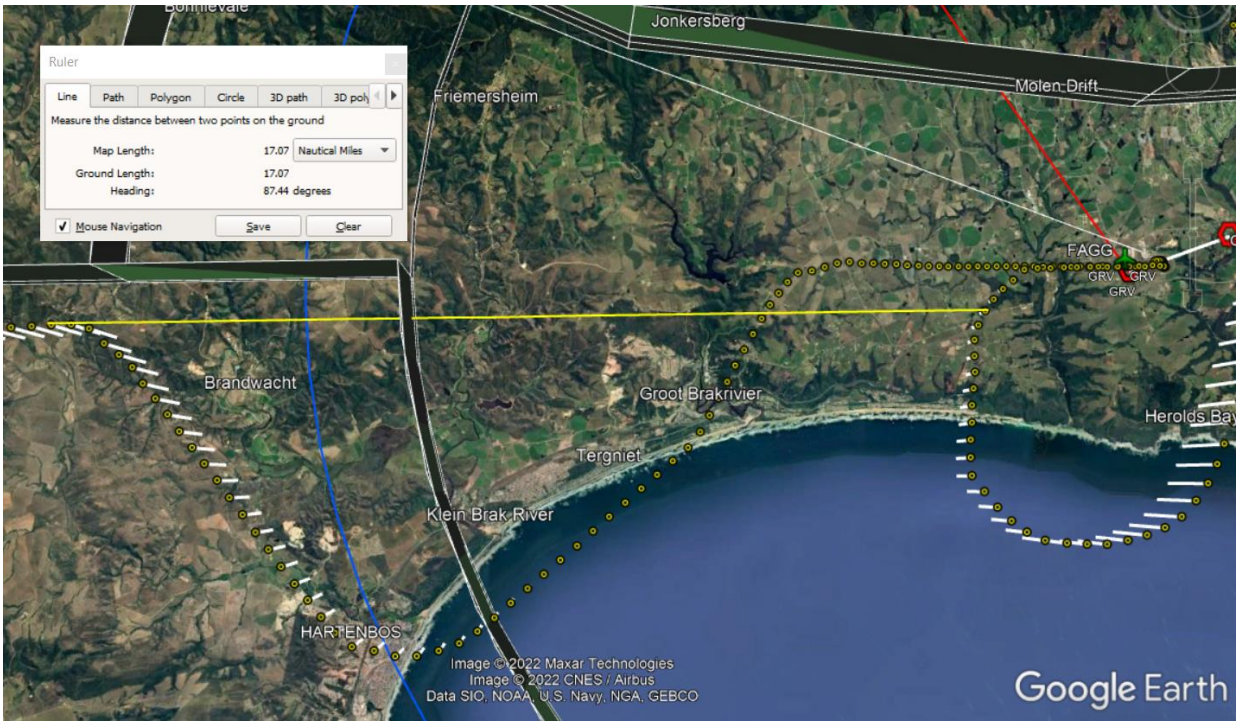

Figure 1: The distance between the two aircraft at 05:47:18Z. (Source: ATNS)

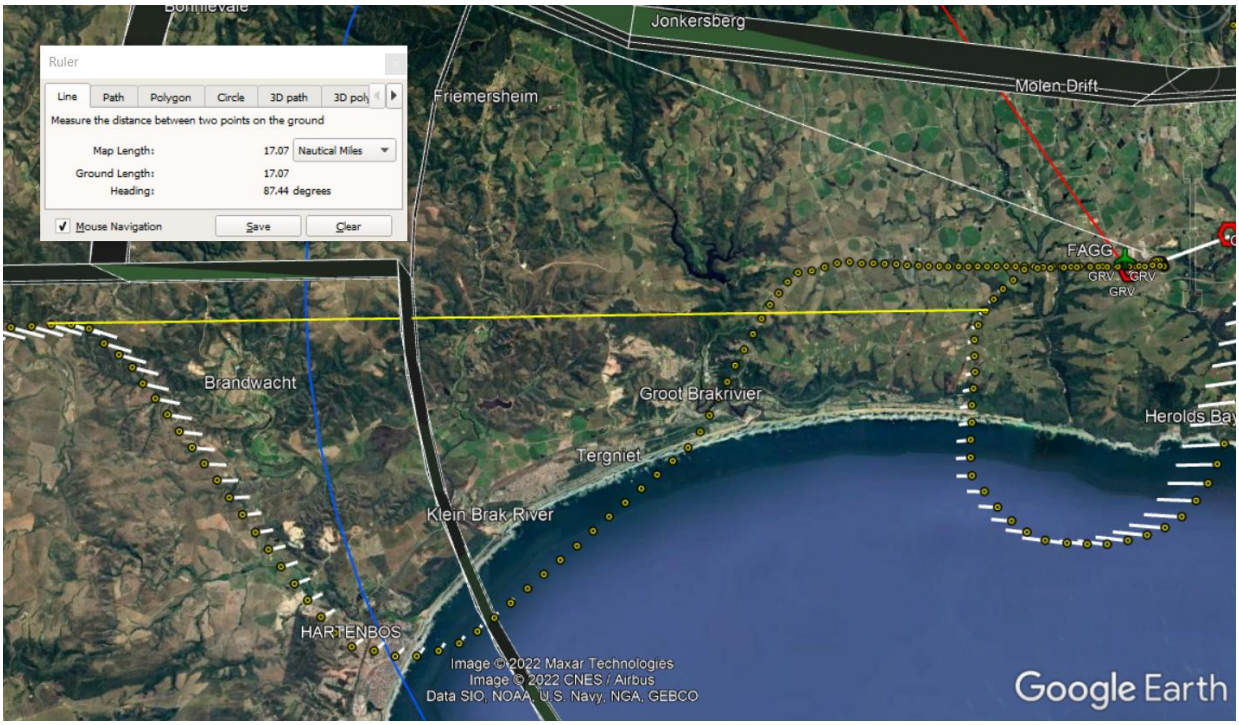

Figure 2: The distance between the two aircraft at 05:48:48Z. (Source: ATNS)

1.1.11 The serious incident occurred during daylight at FAGG in the Western Cape province at Global Positioning System (GPS) co-ordinates determined to be 34°00'15.64" South, 022°22'51.55" East, at an elevation of 639ft.

Figure 3: The radar tracks flown by ZS-ALJ and ZS-CMG, respectively. (Source: Google Earth)

1.2 Injuries to Persons

1.2.1 ZS-ALJ (Link621)

Injuries	Pilot	Crew	Pass.	Total On-board	Other
Fatal	-	-	-	-	-
Serious	-	-	-	-	-
Minor	-	-	-	-	-
None	2	1	28	31	-
Total	**2**	**1**	**28**	**31**	**-**

Note: Other means people on the ground.

1.2.2 ZS-CMG (KEM125)

Injuries	Pilot	Crew	Pass.	Total On board	Other
Fatal	-	-	-	-	-
Serious	-	-	-	-	-
Minor	-	-	-	-	-
None	2	1	38	41	-
Total	**2**	**1**	**38**	**41**	**-**

Note: Other means people on the ground.

1.3 Damage to Aircraft

1.3.1 Neither of the two aircraft sustained damage.

1.4 Other Damage

1.4.1 None.

1.5 Personnel Information

1.5.1 Pilot-in-command (PIC) of ZS-ALJ (Link621)

Nationality	South African	Gender	Male	Age	30
Licence Type	Airline Transport Pilot Licence				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Instrument				
Medical Expiry Date	30 May 2022 (Class 1)				
Restrictions	None				
Previous Incidents	None				

Note: Previous serious incidents/accidents refer to past serious incidents/accidents the pilot was involved in, when relevant to this incident.

Flying Experience:

Total Hours	4 815.0
Total Past 90 Days	187.5
Total on Type Past 90 Days	187.5
Total on Type	2 262.0

1.5.2 First Officer (FO) of ZS-ALJ (Link621)

Nationality	South African	Gender	Male	Age	33
Licence Type	Airline Transport Pilot Licence				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Instrument, Instructor Grade 2, Test Pilot (Class 2)				
Medical Expiry Date	31 January 2022 (Class 1)				
Restrictions	None				
Previous Incidents	None				

Note: Previous serious incidents/accidents refer to past serious incidents/accidents the pilot was involved in, when relevant to this incident.

Flying Experience:

Total Hours	5 315.0
Total Past 90 Days	174.0
Total on Type Past 90 Days	174.0
Total on Type	2 304.0

1.5.3 Pilot-in-command (PIC) of ZS-CMG (KEM125)

Nationality	South African	Gender	Male	Age	65
Licence Type	Airline Transport Pilot Licence				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Instrument, Instructor Grade 1, Designated Flight Examiner (DFE)				
Medical Expiry Date	30 November 2021 (Class 1)				
Restrictions	Pilot must wear corrective lenses Hypertension Protocol				
Previous Incidents	None				

Note: Previous serious incidents/accidents refer to past serious incidents/accidents the pilot was involved in, when relevant to this incident.

Flying Experience:

Total Hours	17 884.7
Total Past 90 Days	149.4
Total on Type Past 90 Days	149.4
Total on Type	7 259.6

1.5.4 First Officer (FO) of ZS-CMG (KEM125)

Nationality	South African	Gender	Male	Age	31
Licence Type	Commercial Pilot Licence				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Instrument				
Medical Expiry Date	28 February 2022 (Class 1)				
Restrictions	Correction for defective distant, intermediate and near vision				
Previous Incidents	None				

Note: Previous serious incidents/accidents refer to past serious incidents/accidents the pilot was involved in, when relevant to this incident.

Flying Experience:

Total Hours	1 409.9
Total Past 90 Days	84.8
Total on Type Past 90 Days	74.3
Total on Type	290.1

Total Hours Aeroplane	586.0
Total Hours Helicopter	823.9
Grand Total	1 409.9

1.5.5 Approach Controller

Nationality	South African	Gender	Female	Age	30
Licence Type	Air Traffic Services				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Aerodrome, Approach, Instructor Grade II				
Medical Expiry Date	31 March 2023 (Class 3)				
Restrictions	None				
Previous Incidents	None				

1.6 Aircraft Information

1.6.1 Embraer EMB-135KL

Figure 4: Embraer EMB-135KL, ZS-ALJ. (Source: www.airliners.net)

The Embraer ERJ 145 family is a series of regional jets produced by Embraer, a Brazilian aerospace company. Family members include the ERJ 135 (37 passengers), ERJ 140 (44 passengers) and ERJ 145 (50 passengers). The aircraft is powered by two Rolls Royce AE3007 series engines with a low-wing configuration.

Airframe of ZS-ALJ:

Manufacturer/Model	Embraer Empresa Brasileira/EMB-135KL	
Serial Number	145579	
Year of Manufacture	2002	
Total Airframe Hours (at time of serious incident)	34 961.34	
Last Inspection (hours & date)	34 690.15	29 June 2021
Airframe Hours Since Last Inspection	271.19	
C of A (issue date), (expiry date)	30 May 2018	31 May 2022
C of R (issue date) (Present Owner)	13 April 2018	
Operating Category	Standard Transport (Aeroplane)	
MTOW	21 100kg (46 517lbs)	
Type of Fuel Used	Jet A1	
Previous Serious Incidents	None	

Note: Previous serious incidents refer to past serious incidents the aircraft was involved in, when relevant to this incident.

Engine No. 1:

Manufacturer/Model	Rolls Royce AE 3007A1
Serial Number	CAE311906
Hours Since New	31 489.01
Hours Since Overhaul	Modular engine

Engine No. 2:

Manufacturer/Model	Rolls Royce AE 3007A1
Serial Number	CAE312152
Hours Since New	32 174.17
Hours Since Overhaul	Modular engine

1.6.2 Bombardier CL-600-2B19

Figure 5: Bombardier CL-600-2B19, ZS-CMG. (Source: www.airliners.net)

The Bombardier CL-600 series is a low-wing jet powered by two General Electric CF34s turbofan engines mounted in aft fuselage pods. The engines are fitted with thrust reversers to decrease the landing distances. The aircraft was type certified on 10 August 1980 by Transport Canada.

Airframe of ZS-CMG:

Manufacturer/Model	Bombardier Incorporated/CL-600-2B19	
Serial Number	8028	
Year of Manufacture	2005	
Total Airframe Hours (at time of serious incident)	21 864.44	
Last Inspection (hours & date)	21 556.80	23 April 2021
Airframe Hours Since Last Inspection	307.64	
C of A (issue date), (expiry date)	21 April 2021	30 April 2022
C of R (issue date) (Present Owner)	10 September 2019	
Operating Category	Standard Transport (Aeroplane)	
MTOW	21523 kg	
Type of Fuel Used	Jet A1	
Previous Serious Incidents	None	

Note: Previous serious incidents refer to past serious incidents the aircraft was involved in, when relevant to this incident.

Engine No. 1:

Manufacturer/Model	General Electric CF34-3B1
Serial Number	950285
Hours Since New	19 806.32
Hours Since Overhaul	Modular engine

Engine No. 2:

Manufacturer/Model	General Electric CF34-3B1
Serial Number	950404
Hours Since New	19 391.72
Hours Since Overhaul	Modular engine

1.7 Meteorological Information

1.7.1 The weather information below was obtained from the Meteorological Aerodrome Report (METAR) that was issued by the South African Weather Service (SAWS), recorded at George on 23 August 2021 at 0530Z.

FAGG 230530Z 35004KT CAVOK 06/04 Q1018=

Wind Direction	350°	Wind Speed	4kt	Visibility	+ 10km
Temperature	6°C	Cloud Cover	Nil	Cloud Base	Nil
Dew Point	4°C	QNH	1018hPa		

1.8 Aids to Navigation

1.8.1 Both aircraft were equipped with standard navigational equipment as approved by the Regulator (SACAA). There were no records indicating that the navigation system was unserviceable prior to the serious incident.

1.9 Communication

1.9.1 Both aircraft were equipped with standard communication equipment as approved by the Regulator.

1.9.2 Both aircraft were fitted with transponders; ZS-ALJ (Link621) was issued squawk code 3254 and ZS-CMG (KEM125) was issued squawk code 3271.

1.9.3 The Approach Control very high frequency (VHF) that was in use at FAGG was 128.20 MHz, and the Tower frequency was 118.90 MHz.

1.9.4 The Approach Controller was able to communicate with ZS-CMG on both frequencies as it was possible to combine the Tower and Approach Control frequencies via voice communication and control system (VCCS).

1.9.5 Radio transmissions and radar data were recorded as both aircraft were flying in controlled airspace at the time of the serious incident.

1.9.6 A transcript of communication between the Approach Controller at George and the ZS-ALJ and ZS-CMG aircraft is attached to this report as Appendix B.

1.10 Aerodrome Information

1.10.1 This serious incident occurred at FAGG.

Aerodrome Location	George Aerodrome (FAGG)
Aerodrome Status	Licensed
Aerodrome Co-ordinates	34°00’24.13” South 022°22’27.41” East
Aerodrome Elevation	648 ft
Runway Headings	11/29
Runway Dimension	2000m x 45 m
Runway Used by ZS-CMG	29
Runway ZS-ALJ was cleared to land on	11
Runway Surface	Asphalt
Approach Facilities	Runway lights, PAPI, DVOR / DME (GRV), ILS for both runways
Tower Frequency	118.90 MHz
Approach Frequency	128.20 MHz

The aerodrome chart for FAGG is attached as Appendix C.

1.11 Flight Recorders

1.11.1 Both aircraft were equipped with flight data recorders (FDR) and cockpit voice recorders (CVR).

1.11.2 Neither of the units was downloaded as both aircraft continued with normal scheduled flights after the serious incident.

1.12 Wreckage and Impact Information

1.12.1 Not applicable.

1.13 Medical and Pathological Information

1.13.1 Not applicable.

1.14 Fire

1.14.1 There was no fire during this incident.

1.15 Survival Aspects

1.15.1 This serious incident was survivable as the collision was averted.

1.16 Tests and Research

1.16.1 None.

1.17 Organisational and Management Information

1.17.1 Both flights were air transport operations conducted under the provisions of Part 121 of the CAR 2011 as amended.

1.17.2 The operator for the ZS-ALJ (Link621) aircraft that departed FACT was issued a Class I Domestic Air Service Licence effective from 23 February 2005 and a Class II Domestic Air Service Licence effective from 14 January 2018 by the Department of Transport.

1.17.3 The operator for the ZS-ALJ (Link621) aircraft was issued a SACAA Air Operating Certificate (AOC) on 21 April 2021 with an expiry date of 30 April 2022.

1.17.4 The operator for the ZS-CMG (KEM125) aircraft that departed FAGG was issued a Class I Domestic Air Service Licence effective from 11 February 2015 and a Class II Domestic Air Service Licence effective from 11 February 2015 by the Department of Transport.

1.17.5 The operator for the ZS-CMG (KEM125) aircraft was issued a SACAA Air Operating Certificate (AOC) on 20 November 2020 with an expiry date of 30 November 2021.

1.18 Additional Information

1.18.1 Air Proximity Hazard (Airprox)

Definition of an Airprox as per ICAO Doc 4444, PANS-ATM

"A situation in which, in the opinion of a pilot or a controller, the distance between aircraft, as well as their relative positions and speed, was such that the safety of the aircraft involved was, or may have been, compromised."

1.18.2 Separation of departing aircraft from arriving aircraft

Source: ICAO Doc 4444, Air Traffic Management, Sixteenth Edition 2016, Chapter 5, Pg.116

5.7.1 Except as otherwise prescribed by the appropriate ATS authority, the following separation shall be applied when take-off clearance is based on the position of an arriving aircraft.

5.7.1.1 If an arriving aircraft is making a complete instrument approach, a departing aircraft may take off:
a) in any direction until an arriving aircraft has started its procedure turn or base turn leading to final approach;
b) in a direction which is different by at least 45 degrees from the reciprocal of the direction of approach after the arriving aircraft has started procedure turn or base turn leading to final approach, provided that the take-off will be made at least 3 minutes before the arriving aircraft is estimated to be over the beginning of the instrument runway (see Figure 6).

5.7.1.2 If an arriving aircraft is making a straight-in approach, a departing aircraft may take off:
a) in any direction until 5 minutes before the arriving aircraft is estimated to be over the instrument runway;
b) in a direction which is different by at least 45 degrees from the reciprocal of the direction of approach of the arriving aircraft:

1) until 3 minutes before the arriving aircraft is estimated to be over the beginning of the instrument runway (see Figure 6); or

2) before the arriving aircraft crosses a designated fix on the approach track; the location of such fix to be determined by the appropriate ATS authority after consultation with the operators.

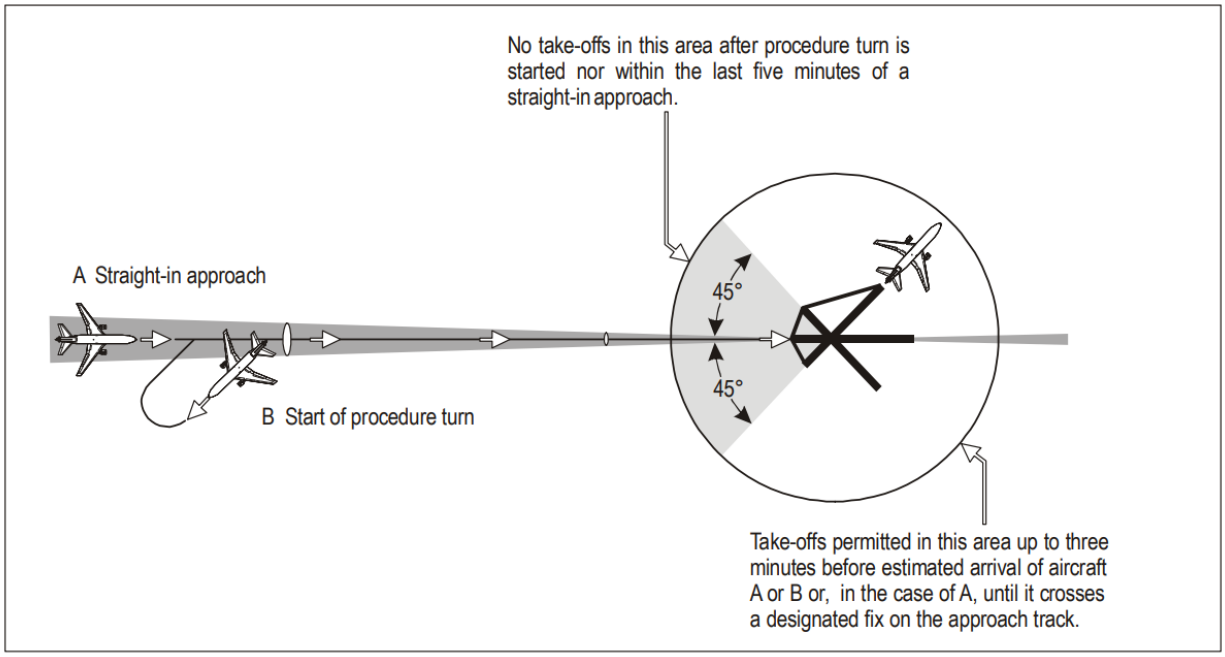

Illustration 1: Separation of departing aircraft from arriving aircraft. (Source: ICAO Doc 4444)

1.18.3 Traffic Alert and Collision Avoidance System (TCAS)

TCAS is an implementation of the ICAO Airborne Collision Avoidance System (ACAS) standard.

Definition of ACAS as per ICAO Doc 4444

"Airborne collision avoidance system (ACAS). An aircraft system based on secondary surveillance radar (SSR) transponder signals which operates independently of ground-based equipment to provide advice to the pilot on potential conflicting aircraft that are equipped with SSR transponders."

In fact, it is currently the only implementation of the ACAS, hence the two terms, TCAS and ACAS, are often used interchangeably. TCAS gives Traffic Information about other 'cooperating' aircraft which are displayed as various symbols in various colours (depending on system parameters) and will also tell one how to get out of the way - as long as the other aircraft is 'cooperating'.

Source: Federal Aviation Administration, Introduction to TCAS II, Version 7.1, Pg. 17

"TCAS has the requirement to provide reliable surveillance out of range of 14nm and in traffic densities of up to 0.3 aircraft per square nautical mile. The surveillance function provides the range, altitude and bearing of nearby aircraft to the collision avoidance function so that threat

determinations can be made and so that the information displayed on the traffic display is accurate. The TCAS surveillance is compatible with both the Air Traffic Control Radar Beacon System (ATCRBS) and Mode S transponders. TCAS can simultaneously track up to 30 transponder-equipped aircraft within a nominal range of 30nm."

1.18.4 Notice to Airmen (NOTAM)

The NOTAMs listed below were issued for FAGG Tower, which was applicable from 14 April 2021 to 12 September 2021, indicating the tower hours to be from 0545Z to 1700Z from Mondays to Fridays.

B0634/21 NOTAMN
Q) FACA/QPFCA/IV/NBO/AE/000/999/3400S02222E005
A) FAGG **B)** 2104141413 **C)** 2106161200 EST
E) COVID-19:
ALL SKED AND CHARTER DOM SER OPR TO AND FM FAGG MAY ONLY DO SO WI RFFS HR OF:
A. MON TO FRI BTN 0545-1700.
B. SAT BTN 0630-1300.
C. SUN BTN 0630-1730.
GEN AVIATION ACFT LESS THAN 5700KG AND ALL TRG OPS OPR TO AND FM FAGG MAY ONLY DO SO MON-SUN 0400-1800. WHERE ATS AND RFFS SER IS NOT AVBL PILOT WILL OPR AT DISCRETION.
FOR THE PURPOSE OF ATFM FAGG RWY CAPACITY WILL BE DECLARED ACCORDING TO THE FLW RULES:
1. HOURLY TOTAL MOV IS 15.
2. HOURLY ARR MOV IS 15 AND/OR DEP IFR MOV IS 15.
AIR AMBULANCE OPS ARE NOT SUBJ ATFM INITIATIVES.
ALL QUERIES MAY BE DIRECTED TO [redacted] CTC NUMBER [redacted]

B1013/21 NOTAMN
Q) FACA/QPFCA/IV/NBO/AE/000/999/3400S02222E005
A) FAGG **B)** 2106161235 **C)** 2108121230 EST
E) COVID-19:
ALL SKED AND CHARTER DOM SER OPR TO AND FM FAGG MAY ONLY DO SO WI RFFS HR OF OPR:
A. MON TO FRI BTN 0545-1700.
B. SAT BTN 0630-1300.
C. SUN BTN 0630-1730.
GEN AVIATION ACFT LESS THAN 5700KG AND ALL TRG OPS OPR TO AND FM FAGG MAY ONLY DO SO MON-SUN 0400-1800. WHERE ATS AND RFFS SER IS NOT AVBL PILOT WILL OPR AT DISCRETION.
FOR THE PURPOSE OF ATFM FAGG RWY CAPACITY WILL BE DECLARED ACCORDING TO THE FLW RULES:
1. HOURLY TOTAL MOV IS 15.
2. HOURLY ARR MOV IS 15 AND/OR DEP IFR MOV IS 15.
AIR AMBULANCE OPS ARE NOT SUBJ ATFM INITIATIVES.
ALL QUERIES MAY BE DIRECTED TO [redacted] CTC NUMBER [redacted]

This NOTAM was active at the time of the serious incident.

B1255/21 NOTAMN
Q) FACA/QPFCA/IV/NBO/AE/000/999/3400S02222E005
A) FAGG **B)** 2108121344 **C)** 2111091230 EST
E) COVID-19:
ALL SKED AND CHARTER DOM SER OPR TO AND FM FAGG MAY ONLY DO SO WI RFFS HR OF OPR:
A. MON TO FRI BTN 0545-1700.
B. SAT BTN 0630-1300.
C. SUN BTN 0630-1730.
GEN AVIATION ACFT LESS THAN 5700KG AND ALL TRG OPS OPR TO AND FM FAGG MAY ONLY DO SO MON-SUN 0400-1800. WHERE ATS AND RFFS SER IS NOT AVBL PILOT WILL OPR AT DISCRETION.
FOR THE PURPOSE OF ATFM FAGG RWY CAPACITY WILL BE DECLARED ACCORDING TO THE FLW RULES:
1. HOURLY TOTAL MOV IS 15.
2. HOURLY ARR MOV IS 15 AND/OR DEP IFR MOV IS 15.
AIR AMBULANCE OPS ARE NOT SUBJ ATFM INITIATIVES.
ALL QUERIES MAY BE DIRECTED TO [redacted] CTC NUMBER [redacted]

B1357/21 NOTAMN
Q) FACA/QPFCA/IV/NBO/AE/000/999/3400S02222E005
A) FAGG **B)** 2109081543 **C)** 2109121700
E) COVID-19:
ALL SKED AND CHARTER DOM SER OPR TO AND FM FAGG MAY ONLY DO SO WI RFFS HR OF OPR:
A. MON TO FRI BTN 0545-1700.
B. SAT BTN 0630-1300.
C. SUN BTN 0630-1730.
GEN AVIATION ACFT LESS THAN 5700KG AND ALL TRG OPS OPR TO AND FM FAGG MAY ONLY DO SO MON-SUN 0400-1800. WHERE ATS AND RFFS SER IS NOT AVBL PILOT WILL OPR AT DISCRETION.
FOR THE PURPOSE OF ATFM FAGG RWY CAPACITY WILL BE DECLARED ACCORDING TO THE FLW RULES:
1. HOURLY TOTAL MOV IS 15.
2. HOURLY ARR MOV IS 15 AND/OR DEP IFR MOV IS 15.
AIR AMBULANCE OPS ARE NOT SUBJ ATFM INITIATIVES.
ALL QUERIES MAY BE DIRECTED TO [redacted] CTC NUMBER [redacted]

The NOTAM below superseded the above NOTAMs

B1358/21 NOTAMN
Q) FACA/QPFCA/IV/NBO/AE/000/999/3400S02222E005
A) FAGG **B)** 2109130500 **C)** 2111091700 EST
E) COVID-19:
ALL SKED AND CHARTER DOM SER OPR TO AND FM FAGG MAY ONLY DO SO WI RFFS HR OF OPR:
A. MON TO FRI BTN 0530-1700.
B. SAT BTN 0630-1300.
C. SUN BTN 0630-1730.
GEN AVIATION ACFT LESS THAN 5700KG AND ALL TRG OPS OPR TO AND FM FAGG MAY ONLY DO SO MON-SUN 0400-1800. WHERE ATS AND RFFS SER IS NOT AVBL PILOT WILL OPR AT DISCRETION.
FOR THE PURPOSE OF ATFM FAGG RWY CAPACITY WILL BE DECLARED ACCORDING TO THE FLW RULES:

1.19 Useful or Effective Investigation Techniques

1.19.1 No new methods were used.

2. ANALYSIS

2.1 General

From the available evidence, the following analysis was made with respect to this incident. This shall not be read as apportioning blame or liability to any organisation or individual.

2.2 Analysis

2.2.1 The crew of ZS-ALJ

The aircraft departed FACT on a scheduled domestic air transport flight under instrument flight rules (IFR), destined for FAGG. The aircraft was scheduled to depart FACT at 0515Z but took off at 0520Z. The estimated flight time was 35 minutes. At 05:40:54Z, the crew establish communication with Approach Controller at FAGG whilst under radar control, who instructed them to descend to FL150 and to expect vectors for the ILS approach Runway 11. At this stage, the aircraft was approximately 55nm from FAGG, which was just prior to entering the Terminal Manoeuvring Area (TMA) of FAGG. At 05:47:06Z, approximately 17nm from FAGG, the Approach Controller instructed the crew to turn right on a heading of 165° to avoid conflicting traffic (KEM125) that was departing from Runway 29 (pilot's discretion). The crew was informed by Approach Controller at 05:48:49Z to join Runway 11 for a visual approach; the aircraft landed safely at 05:54:17Z.

2.2.2 The crew of ZS-CMG

The decision by the PIC of ZS-CMG (KEM125) to not wait for the official opening of the Tower at FAGG at 05:45:42Z after being advised by the Approach Controller resulted in this serious incident. By opting to take-off from Runway 29, which was the PIC's discretion after being informed that a scheduled air transport flight carrying passengers was on approach for Runway 11 was a display of poor airmanship and a disregard for safe operating procedures. The decision by the PIC to use Runway 29 for take-off placed the aircraft on a reciprocal track with ZS-ALJ (Link621). This decision by the PIC of ZS-CMG (KEM125) required the intervention of the Approach Controller who, in an attempt to avoid an accident, instructed ZS-ALJ (Link621) to turn to the right of the track on a heading of 165° and to descend to 6 000ft.

At no time, prior to take-off from Runway 29, did the crew members of ZS-CMG (KEM125) enquire from the Approach Controller about the distance the ZS-ALJ (Link621) was at from

FAGG. Without this critical information, the PIC continued to take-off from Runway 29.

It should be taken into account that ZS-CMG (KEM125) was only issued a squawk code (# 3271) at 05:47:55Z whereafter the aircraft was identified on radar. By that time, the aircraft was passing through 4 800ft while in a left turn over the sea.

2.2.3 Approach Control

Approach Control at FAGG opened at 0530Z, which was 15 minutes prior to the Tower opening time. The Approach Controller was in radio communication with ZS-ALJ (Link621), which was inbound from FACT to FAGG. The crew was informed to expect vectors for the ILS approach Runway 11. Following the decision by the PIC of KEM125 to take-off from Runway 29, which placed them on a reciprocal track with ZS-ALJ (Link621), the Approach Controller had to instruct ZS-ALJ (Link621) to turn right on a heading of 165° to maintain adequate separation between the two aircraft.

2.2.4 Environment

Approach Control at FAGG provided the following weather information to ZS-ALJ (Link621); *"The surface wind at the moment, northerly less than 5 knots, the temperature is 6°C, dew point 4°C, QNH 1018 and it is CAVOK."*

2.2.5 Conclusion

It should be noted that aircraft on approach for landing have priority over departing aircraft as stipulated in the International Civil Aviation Organisation (ICAO) Doc 4444, pg. 171. From the radar data available, ZS-ALJ (Link621) was 23nm from the threshold of Runway 11 and descending through 9 000ft when ZS-CMG (KEM125) commenced with their take-off roll. At no stage, prior to commencing with their take-off roll, did any of the crew members enquire with either the Approach Controller or the crew of ZS-ALJ (Link621) about the distance and the time the aircraft was from FAGG. The PIC made a decision without gathering essential information prior to electing to use Runway 29. Also, he did not take cognisance of the fact that he was informed of the aircraft that was on approach for Runway 11. Moreover, he did not wait for the Tower to open.

The pilot's primary responsibility is to fly the aircraft safely. Pilots should remain alert to all other traffic movements within their vicinity. The performance capabilities of all aircraft are different in both speed and rate of climb/descent, resulting in high closure rates limiting the time available for detection, decision-making and evasive action. It is essential that the greatest degree of safety and vigilance are always complied with.

3. CONCLUSION

3.1 General

From the available evidence, the following findings, causes and contributing factors were made with respect to this serious incident. These shall not be read as apportioning blame or liability to any organisation or individual.

To serve the objective of this investigation, the following sections are included in the conclusion heading:

- **Findings —** are statements of all significant conditions, events, or circumstances in this serious incident. The findings are significant steps in this incident sequence, but they are not always causal or indicate deficiencies.
- **Causes —** are actions, omissions, events, conditions, or a combination thereof, which led to this serious incident.
- **Contributing factors —** are actions, omissions, events, conditions, or a combination thereof, which, if eliminated, avoided or absent, would have reduced the probability of the serious incident occurring, or would have mitigated the severity of the consequences of the serious incident. The identification of contributing factors does not imply the assignment of fault or the determination of administrative, civil, or criminal liability.

3.2 Findings

<u>The crew of ZS-ALJ (Link621)</u>

3.2.1 The PIC was in possession of an Airline Transport Pilot Licence (ATPL). According to his logbook, he had flown a total of 4 815.0 hours, of which 2 262.0 hours were on the aircraft type.

3.2.2 The PIC was issued a valid Class 1 aviation medical certificate on 25 May 2021 with an expiry date of 31 May 2022.

3.2.3 The FO was in possession of an Airline Transport Pilot Licence. According to his logbook, he had flown a total of 5 315.0 hours, of which 2 304.0 hours were on the aircraft type.

3.2.4 The FO was issued a valid Class 1 aviation medical certificate on 20 January 2021 with an expiry date of 31 January 2022.

The crew of ZS-CMG (KEM125)

3.2.5 The PIC was in possession of an Airline Transport Pilot Licence (ATPL). According to his logbook, he had flown a total of 17 884.7 hours, of which 7 259.6 hours were on the aircraft type.

3.2.6 The PIC was issued a valid Class 1 aviation medical certificate on 1 May 2021 with an expiry date of 30 November 2021.

3.2.7 The FO was in possession of a Commercial Pilot Licence (CPL). According to his logbook, he had flown a total of 1 409.9 hours, of which 290.1 hours were on the aircraft type.

3.2.8 The FO was issued a valid Class 1 aviation medical certificate on 4 February 2021 with an expiry date of 28 February 2022.

The aircraft ZS-ALJ (Link621)

3.2.9 The aircraft was issued a Certificate of Airworthiness on 30 May 2018 with an expiry date of 31 May 2022.

3.2.10 The aircraft was issued a Certificate of Registration on 13 April 2018.

3.2.11 The last scheduled maintenance inspection carried out on the aircraft prior to the serious incident flight was certified on 29 June 2021 at 34 690.15 airframe hours. The aircraft had accumulated a further 271.14 airframe hours since the said inspection.

The aircraft ZS-CMG (KEM125)

3.2.12 The aircraft was issued a Certificate of Airworthiness on 21 April 2021 with an expiry date of 30 April 2022.

3.2.13 The aircraft was issued a Certificate of Registration on 10 September 2019.

3.2.14 The last scheduled maintenance inspection carried out on the aircraft prior to the incident flight was certified on 23 April 2021 at 21 556.80 airframe hours. The aircraft had accumulated a further 307.64 airframe hours since the said inspection.

Environment

3.2.15 Fine weather conditions prevailed at FAGG at the time of the flights, and visibility was good.

Aviation Operating Certificates (AOC)

3.2.16 The operator for the ZS-ALJ (Link621) aircraft that departed FACT was in possession of a valid SACAA-issued AOC, issued on 21 April 2021 with an expiry date of 30 April 2022.

3.2.17 The operator for the ZS-CMG (KEM125) aircraft that departed FAGG was in possession of a valid SACAA-issued AOC, issued on 20 November 2020 with an expiry date of 30 November 2021.

Air Traffic Control

3.2.18 The Approach Controller was issued an Air Traffic Service Licence on 12 November 2013.

3.2.19 The Approach Controller was issued a valid Class 3 aviation medical certificate on 26 March 2019 with an expiry date of 31 March 2023.

3.2.20 A NOTAM was issued on 16 June 2021 stating that “Approach Control at FAGG will open at 0530Z, Monday to Friday, and the Tower will open at 0545Z”.

3.2.21 For the 15-minute period from when Approach Control was open until the Tower opened, the two frequencies were combined via the VCCS system. This function allows the Approach Controller to listen and speak on both frequencies.

3.2.22 The Approach Controller instructed ZS-ALJ (Link621) to turn to the right of the track until they were safely clear of the conflicting departing aircraft.

3.3 Probable Cause/s

3.3.1 The ZS-CMG (KEM125) elected to take-off from Runway 29 by following the unmanned aerodrome departure procedures (pilot’s discretion) before the Tower officially opened at 0545Z. This was after being advised by the Approach Controller that Runway 11 was in use and that there was an aircraft (Link621) inbound for landing from the west. This resulted in the two aircraft being on reciprocal tracks. The Approach Controller had to put safety measures in place by instructing ZS-ALJ (Link621) to deviate from its inbound track by turning

to the right of the track until they were safely clear of the departing traffic.

3.4 Contributory Factor/s

3.4.1 ZS-CMG (crew) departed Runway 29 knowing that there was conflicting traffic on approach for Runway 11.

3.4.2 Approach Control opened 15 minutes before the Tower at FAGG.

3.4.3 There was a NOTAM issued, which informed all flying crew about the opening (operating) times of Approach Control and the Tower at FAGG. These NOTAMs have been issued for some time prior to this serious incident.

3.4.4 It could not be established why the ZS-CMG (KEM125) could not wait for the Tower to officially open at 0545Z.

4. SAFETY RECOMMENDATIONS

4.1 General

The safety recommendations listed in this report are proposed according to paragraph 6.8 of Annex 13 to the Convention on International Civil Aviation and are based on the conclusions listed in heading 3 of this report. The AIID expects that all safety issues identified by the investigation are addressed by the receiving States and organisations.

4.2 Safety Recommendation/s

4.2.1 It is recommended in the interest of aviation safety that the Tower and Approach Control stations at FAGG open at the same time. The rationale as to why the two stations opened at different times could not be determined with certainty, but posed a serious safety implication on the operations at the aerodrome, which resulted in this serious incident.

The aerodrome departure schedule indicated that flight KEM125 departs FAGG at 0545Z from Monday to Friday, and Link621 departs FACT at 0515Z and arrives at FAGG any time between 0545Z and 0600Z. With this information, the aerodrome and air traffic services had operated in this manner for several months with reference to the NOTAM issued. The KEM125 crew was aware of the NOTAM but did not wait for the Tower to open even after they were informed by Approach Control of the situation with Link621.

NOTE: This safety recommendation was issued shortly after the serious incident and was closed by the time this report was concluded.

5. APPENDICES

5.1 Appendix A (NOTAM for FAGG Approach and Tower)

5.2 Appendix B (Transcript of the communication between the two aircraft and Approach Control)

5.3 Appendix C (FAGG Aerodrome Chart)

This report is issued by:

Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa

Appendix A

FAGG (GEORGE)

AGA **B)** 2108230645 **C)** 2111151015 EST (B1304/21)
D) EV MON 0645-1015
E) RWY 11/29 AND RWY STRIP AREA WIP. 5MIN PN TO VACATE FOR SKED ACFT. NIL FIXED WING TRG FLT ALLOWED ON RWY AND ALL TWY.

AGA **B)** 2108180645 **C)** 2110061015 (B1270/21)
D) EV WED 0645-1015
E) WIP ON TWY A, A1, A2, A3, B, C, AND TXL A. 5MIN PN TO VACATE FOR SKED FLT. NIL FIXED WING TRG FLT ALLOWED TO USE RWY AND TWY.

AGA **B)** 2107300929 **C)** 2109300900 EST (B1204/21)
D) MON-FRI 0500-0545
SAT 0515-0545
SUN 0545-0615
E) COVID-19:
RWY 11/29 INSPECTION TAKING PLACE. NIL TRG ALLOWED.

AGA **B)** 2107280647 **C)** 2109301200 EST (B1191/21)
E) TWIN ENG ACFT BASED IN GA AREA TO USE DECOMMISSIONED RWY TO DO ENG RUNS. THE AREA WILL BE CALLED ENG RUN-UP BAY. IT SHALL NOT BE USED DRG LOW VIS COND, NGT TIME AND BY ACFT WITH A WINGSPAN THAT IS MORE THAN 14M.

ATM **B)** 2108121344 **C)** 2111091230 EST (B1255/21)
E) COVID-19:
ALL SKED AND CHARTER DOM SER OPR TO AND FM FAGG MAY ONLY DO SO WI RFFS HR OF OPR:
A. MON TO FRI BTN 0545-1700.
B. SAT BTN 0630-1300.
C. SUN BTN 0630-1730.
GEN AVIATION ACFT LESS THAN 5700KG AND ALL TRG OPS OPR TO AND FM FAGG MAY ONLY DO SO MON-SUN 0400-1800. WHERE ATS AND RFFS SER IS NOT AVBL

PILOT WILL OPR AT DISCRETION.
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1. HOURLY TOTAL MOV IS 15.
2. HOURLY ARR MOV IS 15 AND/OR DEP IFR MOV IS 15.
AIR AMBULANCE OPS ARE NOT SUBJ ATFM INITIATIVES.
ALL QUERIES MAY BE DIRECTED TO ERIC BOOI CTC NUMBER 0813473678.

ATM **B)** 2106160545 **C)** 2109131700 EST (B1016/21)
E) COVID-19:
TWR OPR HR OF SER CHG TO:
MON-FRI 0545-1700.

ATM **B)** 2106160530 **C)** 2109131700 EST (B1015/21)
E) COVID-19:
APP OPR HR OF SER CHG TO:
MON-FRI 0530-1700

Appendix B

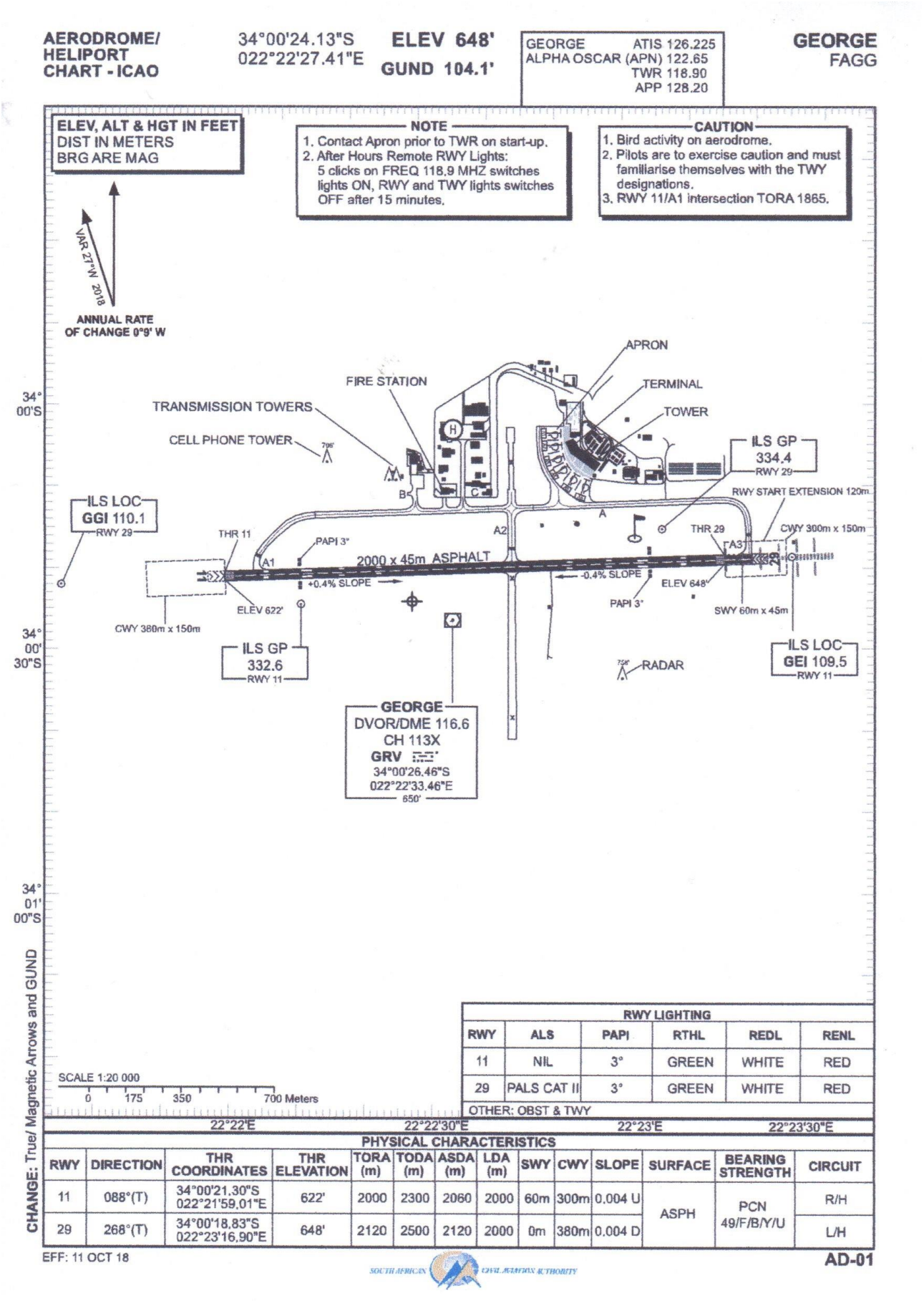
This is a transcript of the communication between the George Approach Controller and the crew of ZS-ALJ (Link621) as well as the crew of ZS-CMG (Cemair125). The frequency in use was 128.20 MHz.

Time	Station	Message
05:40:54	ZS-ALJ	Approach good day to you, Link621.
05:40:59	Approach	Link621, Approach good day, descend to flight level 150 vectors for the ILS runway 11.
05:41:04	ZS-ALJ	Descend to flight level 150, vectors for the ILS runway 11. Just the weather availability for Link621, as there is no ATIS?
05:41:14	Approach	Link621 the tower is still close for ATIS; it will be available within the next 5 minutes. The surface wind at the moment, northerly less than 5 knots, the temperature is 06°C, dew point 04°C, QNH 1018 and it is Kav-oh-kay (CAVOK).
05:41:26	ZS-ALJ	Copy that, thanks Link621.
05:41:52	Approach	Cemair125 this is Approach, I am going to be opening the tower frequency in about 2 minutes. I have opened with runway 11, and there will be a Link inbound in approximately 7 minutes for runway 11.
05:42:10	Approach	Cemair125, Approach.
	ZS-CMG	No audio available from this aircraft, on this recording, at this time. It could have been that the aircraft was on the tower frequency.
05:42:16	Approach	Cemair125, I will be opening the frequency within the next 2 minutes for runway 11 there is a Link inbound for 11 in about 7 minutes.
	ZS-CMG	No audio available from this aircraft, on this recording, at this time. It could have been that the aircraft was on the tower frequency.
05:42:26	Approach	Cemair125, copied to hold position at Alpha 3 holding point.
05:42:40	Approach	Link621 descend to 4500 feet the QNH 1018, plan to backtrack to vacate Alpha 2.

05:42:59	Approach	Link621, Approach.
05:43:01	ZS-ALJ	Go ahead for Link621.
05:43:03	Approach	Link621, descend to 4500 the QNH 1018, plan to backtrack to vacate Alpha 2.
05:43:12	ZS-ALJ	We plan to backtrack to vacate Alpha 2, descend to 5000, Link621.
05:43:19	Approach	Link621 the altitude 4500.
05:43:21	ZS-ALJ	Apologies 4500, Link621.
05:43:49	Approach	Cemair125, go ahead Sir.
05:43:51	ZS-CMG	Roger, we are ready for an immediate take-off. (PIC speaking)
05:43:58	Approach	Cemair125, unable to accommodate you, the tower is close Sir.
05:44:02	ZS-CMG	Okay then we are going to follow the unmanned procedures, we will be taking off 29, left hand out over the sea, climbing overhead to flight level 100. (PIC speaking)
05:44:23	ZS-CMG	George traffic, Cemair125 a CRJ200, Zulu Sierra Charlie Mike Golf is lining up runway 29 we are taking off it will be an early left hand turn out climbing overhead the airfield initially to flight level 100. (PIC speaking)
05:45:21	ZS-ALJ	Approach Link621 if it helps, we have the field in sight for the visual.
05:45:25	Approach	Link621 apologies, I might have to level you off, I want to see where this Cemair turns, he is lined up at the moment.
05:45:31	ZS-ALJ	Copy that, thanks, Link621.
05:45:34	ZS-CMG	George traffic unmanned, Cemair125 is rolling runway 29, turning out left. (PIC speaking)
05:45:42	Approach	And Cemair125 the tower is now open.
05:45:47	Approach	Link621 stop the descend 8000.
05:45:50	ZS-ALJ	Stop the descend 8000, Link621.
05:47:06	Approach	Link621 turn right heading 165.
05:47:10	ZS-ALJ	Right 165, Link621.
05:47:14	Approach	Link621 descend to 6000 feet.
05:47:17	ZS-ALJ	Descend to 6000 feet, Link621.
05:47:20	ZS-CMG	Good morning, Approach, Cemair125 climbing to 5000, heading 210. (FO speaking)
05:47:27	Approach	Cemair125, squawk 3271.

05:47:31	ZS-CMG	Squawk 3271, Cemair125. (FO speaking)
05:47:36	Approach	Cemair125, climb to flight level 150.
05:47:38	ZS-CMG	Climb to level 150, Cemair125. (FO speaking)
05:47:42	Approach	Cemair125, turn left heading 120.
05:47:45	ZS-CMG	Turn left 120, Cemair125. (FO speaking)
05:47:47	Approach	Link621 descend to 4500 feet.
05:47:50	ZS-ALJ	Descend to 4500 feet, Link621.
05:47:55	Approach	Cemair125, the squawk 3271.
05:47:58	ZS-CMG	3271, Cemair125. (FO speaking)
05:48:10	Approach	Cemair125, radar identified 4.5 miles south of George at 5500 feet you can continue routing Cato the track required is 053.
05:48:19	ZS-CMG	Track Cato, Cemair125. (FO speaking)
05:48:23	Approach	Link621, descend to 3500 feet.
05:48:27	ZS-ALJ	Descend to 3500 feet, Link621.
05:48:30	Approach	Cemair125 you are under radar control.
05:48:31	ZS-CMG	Under radar control, Cemair125. (FO speaking)
05:48:40	Approach	Link621 do you still want the visual?
05:48:45	ZS-ALJ	Yes please, Link621.
05:48:49	Approach	Link621 clear for the right visual runway 11, no further restrictions, radar control terminate.
05:48:54	ZS-ALJ	Clear for the right-hand visual runway 11, Link621.
05:49:47	Approach	Cemair125, contact Cape Town East 124.70.
05:49:51	ZS-CMG	124.7, Cemair125. (FO speaking)

Appendix C


AERODROME/ HELIPORT CHART - ICAO
34°00'24.13"S 022°22'27.41"E
ELEV 648'
GUND 104.1'
GEORGE ATIS 126.225
ALPHA OSCAR (APN) 122.65
TWR 118.90
APP 128.20
GEORGE FAGG
ELEV, ALT & HGT IN FEET
DIST IN METERS
BRG ARE MAG
NOTE
1. Contact Apron prior to TWR on start-up.
2. After Hours Remote RWY Lights: 5 clicks on FREQ 118.9 MHZ switches lights ON, RWY and TWY lights switches OFF after 15 minutes.
CAUTION
1. Bird activity on aerodrome.
2. Pilots are to exercise caution and must familiarise themselves with the TWY designations.
3. RWY 11/A1 intersection TORA 1865.
VAR 27°W 2018
ANNUAL RATE OF CHANGE 0°9' W
APRON
FIRE STATION
TERMINAL
TRANSMISSION TOWERS
TOWER
CELL PHONE TOWER
ILS GP 334.4 RWY 29
ILS LOC GGI 110.1 RWY 29
RWY START EXTENSION 120m
THR 11
PAPI 3°
A1
A2
A3
2000 x 45m ASPHALT
THR 29
CWY 300m x 150m
+0.4% SLOPE
-0.4% SLOPE
ELEV 622'
ELEV 648'
PAPI 3°
SWY 60m x 45m
CWY 380m x 150m
ILS GP 332.6 RWY 11
ILS LOC GEI 109.5 RWY 11
RADAR
GEORGE DVOR/DME 116.6 CH 113X GRV
34°00'26.46"S 022°22'33.46"E
650'
34° 00' 00"S
34° 00' 30"S
34° 01' 00"S
22°22'E
22°22'30"E
22°23'E
22°23'30"E
SCALE 1:20 000
0 175 350 700 Meters
CHANGE: True/ Magnetic Arrows and GUND
RWY LIGHTING
RWY | ALS | PAPI | RTHL | REDL | RENL
11 | NIL | 3° | GREEN | WHITE | RED
29 | PALS CAT II | 3° | GREEN | WHITE | RED
OTHER: OBST & TWY
PHYSICAL CHARACTERISTICS
RWY | DIRECTION | THR COORDINATES | THR ELEVATION | TORA (m) | TODA (m) | ASDA (m) | LDA (m) | SWY | CWY | SLOPE | SURFACE | BEARING STRENGTH | CIRCUIT
11 | 088°(T) | 34°00'21.30"S 022°21'59.01"E | 622' | 2000 | 2300 | 2060 | 2000 | 60m | 300m | 0.004 U | ASPH | PCN 49/F/B/Y/U | R/H
29 | 268°(T) | 34°00'18.83"S 022°23'16.90"E | 648' | 2120 | 2500 | 2120 | 2000 | 0m | 380m | 0.004 D | | | L/H
EFF: 11 OCT 18
SOUTH AFRICAN CIVIL AVIATION AUTHORITY
AD-01