AIRCRAFT SERIOUS INCIDENT REPORT AND EXECUTIVE SUMMARY

			Reference:	CA18/3/2/1408	
Aircraft Registration	ZS-PKB	**Date of Incident**	10 March 2023	**Time of Incident**	0855Z
Type of Aircraft	Beechcraft 1900D		**Type of Operation**	Commercial (Part 135)	
Pilot-in-command Licence Type	Airline Transport Pilot Licence (ATPL)		**Age**	27	**Licence Valid**	Yes
Pilot-in-command Flying Experience		**Total Flying Hours**	1680.1	**Hours on Type**	43.0
Last Point of Departure	O.R. Tambo International Airport (FAOR), Gauteng Province				
Next Point of Intended Landing	Margate Airport (FAMG), KwaZulu-Natal Province				
Damage to Aircraft	Minor				

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

Global Positioning System (GPS) co-ordinates determined to be 26º 08'16" South (S) 028°13'47"East (E), at an elevation of 5 557.743 feet (ft) above ground level (AGL)

Meteorological Information							
Number of People On-board	2+19	**Number of People Injured**	0	**Number of People Killed**	0	**Other (On Ground)**	0

Synopsis

On Friday morning, 10 March 2023, two (2) pilots and nineteen (19) passengers on-board a Beechcraft 1900D aircraft with registration ZS-PKB were taxiing from taxiway India at O.R. Tambo International Airport (FAOR) in Gauteng province when the serious incident occurred. The aircraft was on a scheduled commercial flight to Margate Airport (FAMG) in KwaZulu-Natal province. An instrument flight rules (IFR) plan was filed for the flight. Visual meteorological conditions (VMC) prevailed at the time of the flight.

The aircraft was pushed back from parking bay Charlie 19 (C19) to taxiway India, thereafter, the towbar was disconnected from the aircraft and reconnected to the tug which was parked in front of the aircraft. The aircraft taxied into the stationary tug and, as a result, the aircraft's right leading-edge tip was substantially damaged. The aircraft was taxied back to parking bay C19. The occupants on-board the aircraft were not injured during this serious incident. The passengers were sent back to the terminals and the aircraft was grounded.

Probable Cause

The pilots omitted to ascertain that the aircraft was clear off the tug and towbar before initiating taxi.

Contributory Factors

- Lack of communication between the ramp controller and the tug driver.
- Lack of communication between the ramp controller and the flight crew.
- The ramp controller forgot his responsibilities during the disconnection of the towbar from the aircraft, which was to ascertain that everything is clear (no obstruction) around the aircraft before leaving the aircraft and signalling to the flight crew that they could start taxiing.
- The flight crew was in a rush to make up time as they were delayed.
- Lack of training of the crew on-board and on ground.
- The pilot flying had low hours on the aircraft on type.
- Lack of visual awareness by crew.

SRP Date	16 January 2024	Publication Date	17 January 2024

Occurrence Details

Reference Number	**:** CA18/3/2/1408
Occurrence Category	**:** Category 1
Type of Operation	**:** Commercial (Part 135)
Name of Operator	**:** CemAir
Aircraft Registration	**:** ZS-PKB
Aircraft Make and Model	**:** Beechcraft 1900D.
Nationality	**:** South African
Place	**:** Taxiway India at O.R. Tambo International Airport (FAOR)
Date and Time	**:** 10 March 2023 at 0855Z
Injuries	**:** None
Damage	**:** Minor

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 involving a Beechcraft 1900D which occurred on taxiway India at O.R. Tambo International Airport (FAOR), Gauteng province, on 10 March 2023 at 0855Z. The occurrence was classified as a serious incident according to the CAR 2011 Part 12 and the International Civil Aviation Organisation (ICAO) Annex 13 definitions.

The AIID appointed an investigator-in-charge who dispatched to FAOR to conduct a full investigation. Notifications were sent to the State of Registry, Operator, Design and Manufacturer in accordance with the CAR 2011 Part 12 and ICAO Annex 13 Chapter 4. The State of Design and Manufacturer did not appoint an accredited representative. The AIID is leading the investigation as the Republic of South Africa is the State of Occurrence.

Notes:

1. *Whenever the following words are mentioned in this report, they shall mean the following:*
   Serious Incident — this investigated serious incident
   Aircraft — the Beechcraft 1900D involved in this serious incident
   Investigation — the investigation into the circumstances of this serious incident
   Pilot — the pilot 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
º	Degrees
ºC	Degrees Celsius
AIID	Accident and Incident Investigations Division
AMM	Aircraft Maintenance Manual
AMO	Aircraft Maintenance Organisation
ATC	Air Traffic Control
ATPL	Airline Transport Pilot Licence
CAR	Civil Aviation Regulation
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CRS	Certificate of Release to Service
CVR	Cockpit Voice Recorder
CRM	Crew Resource Management
FAMG	Margate Aerodrome
FAOR	O.R. Tambo International Airport
FDR	Flight Data Recorder
FO	First Officer
ft	Feet
GPS	Global Positioning System
I.A.W.	In Accordance With
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
kt	Knots
METAR	Meteorological Routine Aerodrome Report
hPa	Hectopascal
m	Metres
MHz	Megahertz
PF	Pilot Flying
PM	Pilot Monitoring
QNH	Altitude Above Mean Sea Level
PN	Part Number
RWY	Runway
S	South
SACAA	South African Civil Aviation Authority
SAWS	South African Weather Service
S/N	Serial Number
UTC	Co-ordinated Universal Time
Z	Zulu (Term for Universal Co-ordinated Time - Zero Hours Greenwich)

1. FACTUAL INFORMATION

1.1. History of Flight

1.1.1. On Friday morning, 10 March 2023, a Beechcraft 1900D aircraft with registration ZS-PKB was taxiing from taxiway India at O.R. Tambo International Airport (FAOR) in Gauteng province when the serious incident occurred. The aircraft was on a commercial scheduled flight to Margate Airport (FAMG) in KwaZulu-Natal province. Two (2) pilots and nineteen (19) passengers were on-board. An instrument flight rules (IFR) was filed for this flight. Visual meteorological conditions (VMC) prevailed at the time of the flight which was conducted under the provisions of Part 135 of the Civil Aviation Regulations (CAR) 2011 as amended.

1.1.2. In a recorded statement, the pilot flying (PF) stated that they were parked at C19 at FAOR at 0855Z when they received pushback and start clearance from Air Traffic Control (ATC) ground on frequency 121.9-Megahertz (MHz). The PF stated that during pushback, the engine number 2 was started, followed by engine number 1; and once on taxiway India, the ramp agent signalled to the crew to engage parking brakes before the tug driver disconnected the tow bar. The crew carried out the after-start checklist whilst the tug drove away. The PF stated that he received taxi clearance from ATC; thereafter, he checked and confirmed that the left side of the aircraft had no obstructions whilst the pilot monitoring (PM) confirmed the right side. The PF then released the brakes to begin taxi, but shortly thereafter, the right-wing tip and the underside of the right wing hit the tug. The aircraft was taxied back to parking bay C19 and the engines were shut down.

1.1.3. In an interview with the investigator, the PF stated that the aircraft was scheduled to depart at 0820Z, but there was a problem with the bowser during refuelling, which led to the aircraft being delayed for 35 minutes. The PF also mentioned that he was new to the company and that it was his second time being pushed back in his career — the first time being earlier on the day of the serious incident. He mentioned that he was not aware of the procedures involved in pushbacks and was not familiar with the FAOR layout.

1.1.4. A video footage from FAOR that was shared with the investigator shows *the aircraft parked at C19 at approximately 0855Z. Later, the tug pushes the aircraft back (in a walking pace) to taxiway India whilst the ramp agent walks along side on the left of the tug. Upon reaching the taxiway, the tug driver then positions the aircraft to face east. Thereafter, the ramp agent disconnects the towbar from the tug, and the tug driver drives to the right side of the aircraft and parks the tug facing the C19 parking bay in front of the right wing of the aircraft and inside the demarcation marked C19. The tug driver then jumps out of the tug and assists the ramp agent to disconnect the tow bar from the aircraft. The tug driver then reconnects the tow bar to the tug. Thereafter, the ramp agent walks away facing the C19 parking bay. When he is a few metres away, he turns around to face the aircraft, raises his left hand, and continues to*

walk towards the C19 parking bay. The tug driver then jumps into the tug and closes the door. At that moment, the aircraft starts to move and it impacts the stationary tug with the right wing before it comes to a stop facing slightly south-east.

1.1.5. The aircraft was taxied back to parking bay C19. The occupants were not injured during this serious incident; they were sent back to the terminals and the aircraft was grounded.

1.1.6. The aircraft sustained damage to the right-wing tip and the underside of the right wing.

1.1.7. The serious incident occurred during daytime at Global Positioning System (GPS) co-ordinates determined to be 26º 08'16" South (S) 028°13'47 East (E), at an elevation of 5557.743 feet (ft) above ground level (AGL).

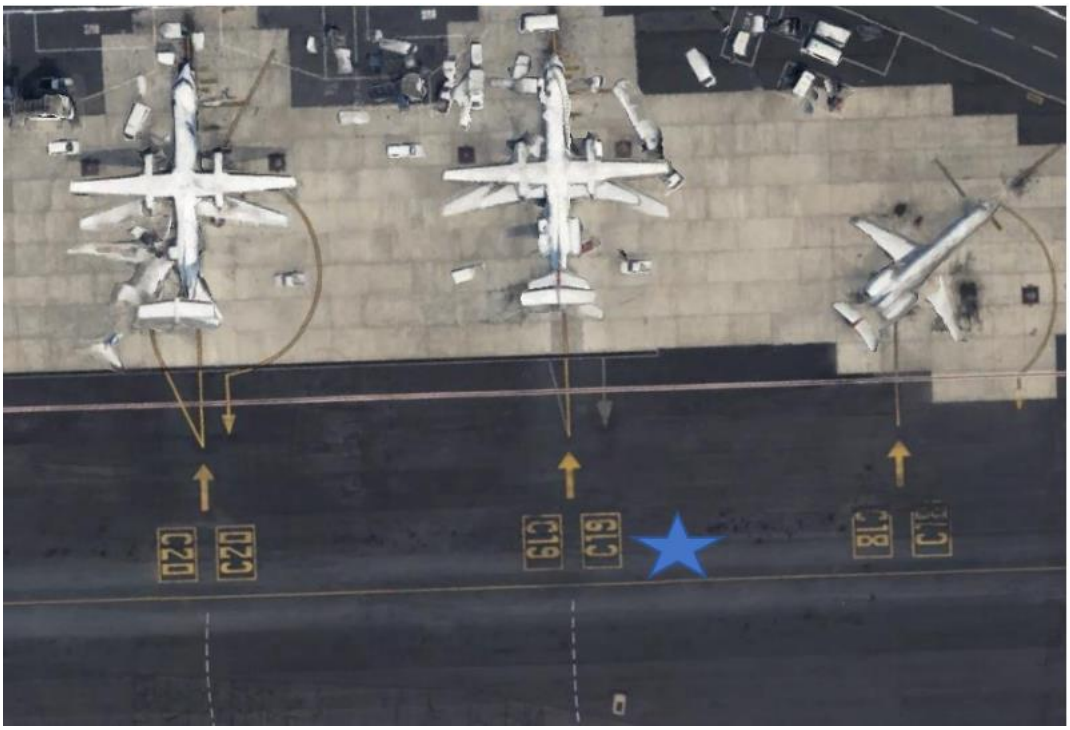


Figure 1: The star indicates the position of the aircraft at C19. (Source: Google Earth)

1.2. Injuries to Persons

Injuries	Pilot	Crew	Pass.	Total On-board	Other
Fatal	-	-	-	-	-
Serious	-	-	-	-	-
Minor	-	-	-	-	-
None	2	-	19	21	-
Total	**2**	**-**	**19**	**21**	**-**

Note: Other means people on the ground.

1.3. Damage to Aircraft

1.3.1. The right wingtip and the underside were damaged.

Figure 2: The damaged wingtip.

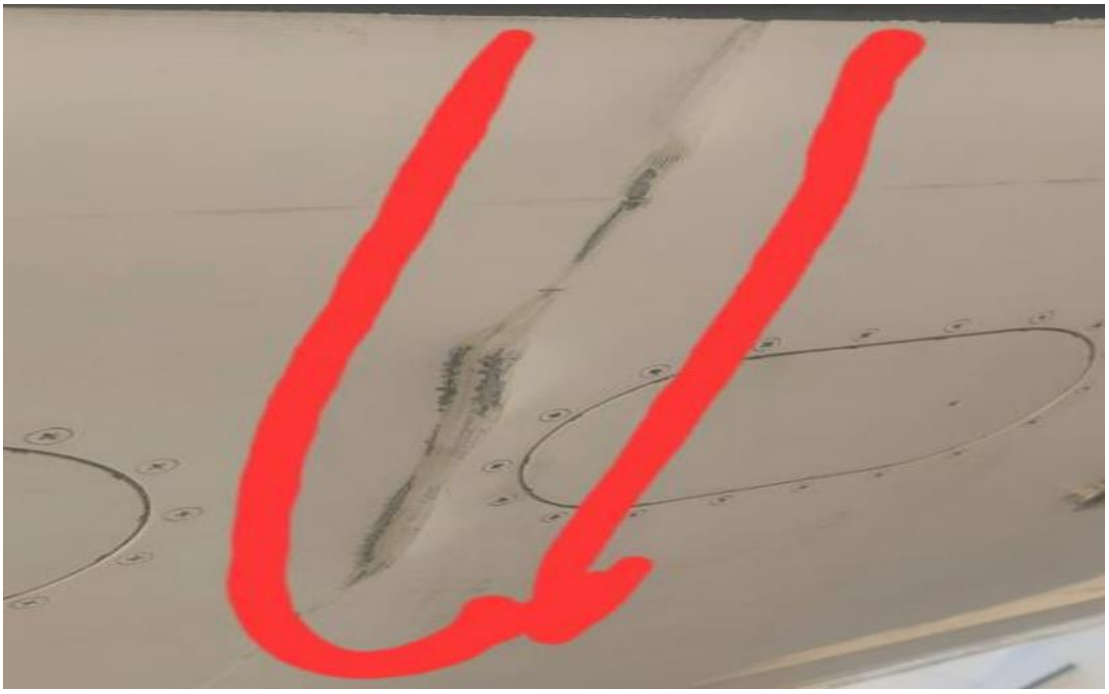


Figure 3: Damage on the underside of the right-wing tip.

1.4. Other Damage

1.4.1. The upper right back side of the tug was abraded, and the rubber lining on the window was partly detached.

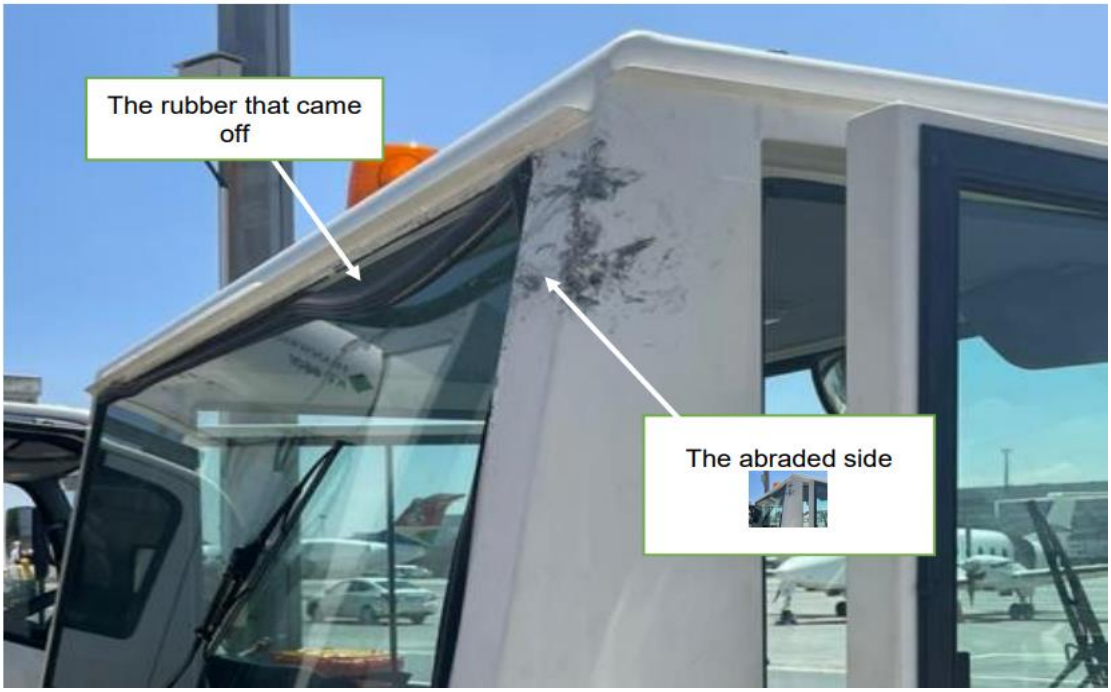


Figure 4: The abraded side of the tug.

1.5. Personnel Information

Pilot-in-command (PIC) who was the pilot flying (PF)

Nationality	South African	Gender	Male	Age	27
Licence Type	Airline Transport Pilot Licence (ATPL				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Instrument, Grade II Flight Instructor and Night rating				
Medical Expiry Date	30 November 2023				
Restrictions	None				
Previous Incidents	None				

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

Flying Experience:

Total Hours	1680.1
Total Past 24 Hours	0
Total Past 7 Days	18.2
Total Past 90 Days	43.0
Total on Type Past 90 Days	43.0
Total on Type	43.0

1.5.1. The PF was initially issued an Airline Transport Pilot Licence (ATPL) on 8 September 2022 with an expiry date of 30 September 2023. The PF was issued a Class 1 medical certificate on 23 November 2022 with an expiry date of 30 November 2023.

1.5.2. According to available information, the PF joined the company on 6 February 2023. He conducted a simulator training exercise for B1900 Command upgrade from 18 to 20 February

2023 with a total of 16 flying hours. From 2 to 6 March 2023, the PF conducted his line flying on a B1900 under supervision with a total of 22.19 flying hours.

1.5.3. The PF took his first command on a B1900 on 10 March 2023. The serious incident flight was his second flight of the day.

1.5.4. The PF completed his Crew Resource Management (CRM) on 7 February 2023 with an expiry date of 29 February 2024.

1.5.5. According to available information, the PF was not trained on marshalling hand signals for aircraft.

Personnel Information

First Officer (FO) who was the pilot monitoring (PM)

Nationality	South African	Gender	Male	Age	36
Licence Type	Airline Transport Pilot Licence (ATPL)				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Instrument, Instructor Grade II and Night rating				
Medical Expiry Date	30 June 2023				
Restrictions	None				
Previous Incidents	None				

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

Flying Experience:

Total Hours	1954.5
Total Past 24 Hours	0
Total Past 7 Days	0
Total Past 90 Days	200
Total on Type Past 90 Days	200
Total on Type	310

1.5.6. The PM was initially issued an Airline Transport Pilot Licence (ATPL) on 28 September 2022. His last licence revalidation was on 29 July 2022 with an expiry date of 31 August 2023. His last proficiency check was on 5 December 2021.

1.5.7. The PM was issued a Class 1 aviation medical certificate on 10 September 2021 with an expiry date of 30 September 2022 with no medical waivers.

1.5.8. The PM completed his CRM on 28 January 2023 with an expiry date of 31 January 2024.

1.5.9. The PM stated that seven days prior to the serious incident flight, he was not flying as he was still on training.

1.5.10. According to available information, the PM was not trained on marshalling hand signals for aircraft.

Tug Driver

1.5.11 The tug driver was issued an Airside Vehicle Operator Permit on 23 November 2022 with an expiry date of 22 November 2024.

1.5.12 The tug driver completed an Airside Induction Training on 22 November 2022 with an expiry date of 21 November 2024.

1.5.13 The tug driver was issued a Certificate of Radiotelephony and Airside Competency on 27 February 2023 with an expiry date of 27 February 2025.

1.5.14 According to available information, the tug driver was not trained on marshalling hand signals for aircraft.

The Ramp Agent

1.5.15 The ramp agent was issued an Airside Vehicle Operator Permit on 23 August 2022 with an expiry date of 23 August 2024.

1.5.16. The ramp agent completed an Airside Induction Training on 23 August 2022 with an expiry date of 22 August 2024.

1.5.17 According to available information, the ramp agent was not trained on marshalling hand signals for aircraft.

1.6. Aircraft Information (Source: Beechcraft 1900 Owner's Manual)

1.6.1. The Beechcraft 1900 is a 19-passenger, pressurised twin-engine turboprop fixed-wing aircraft manufactured by the Beechcraft Division of the Raytheon Company (now Textron Aviation). It was designed and primarily used as a regional airliner. It is also used as a freight aircraft and corporate transport by the United States military and other governments. The aircraft is powered by two PT6A-67D, free turbine and reverse flow turboprop engines. The super freighter has a maximum take-off weight of 17 120 lbs and a wingspan (wingtip to wingtip) of 17.6 metres (m) or 57.7ft.

Airframe:

Manufacturer/Model	Beechcraft/1900D	
Serial Number	UE-003	
Year of Manufacture	1991	
Total Airframe Hours (At Time of Serious Incident)	37755.46	
Last Inspection (Date & Hours)	19 February 2023	37711.41
Airframe Hours Since Last Inspection	44.05	
CRS Issue Date	19 February 2023	
C of A Issue Date & Expiry Date)	15 December 2004	15 December 2004
C of R (Issue Date) (Present Owner)	26 April 2013	
Operating Category	Commercial (Part 135))	
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.

1.6.2 According to available information, the aircraft was first registered to the present owner on 26 April 2013. The aircraft's Certificate of Release to Service (CRS) was issued on 19 February 2023 with an expiry date of 19 February 2025 or at 37 911.41 airframe hours, whichever occurs first.

1.6.3 The aircraft had a valid Certificate of Airworthiness (C of A) that was initially issued by the Regulator on 15 December 2004. The latest C of A had an expiry date of 29 August 2023.

1.6.4 Based on the aircraft maintenance records, the last phase inspection (fourth) was conducted on 19 February 2023 at 37 711.41 airframe hours. The aircraft had accumulated an additional 44.05 airframe hours since the last inspection.

1.6.5 According to available information, the aircraft had no microphone jack, therefore, the crew and the ramp controller relied on hand signalling (gestures) for communication out of hearing range.

Engine: 1

Manufacturer/Model	Pratt & Whitney/Pt6-67D
Serial Number	PCE-PS0672
Part Number	3044800
Hours Since New	2202.8
Hours Since Overhaul	Not Reached

Engine: 2

Manufacturer/Model	Pratt & Whitney/Pt6-67D
Serial Number	PS114120
Part Number	3044800
Hours Since New	2203.55
Hours Since Overhaul	Not Reached

Propeller: 1

Manufacturer/Model	Hartzell
Serial Number	HJ-2282
Part Number	HC-E4A-31
Hours Since New	1767.69
Hours Since Overhaul	Not Reached

Propeller: 2

Manufacturer/Model	Hartzell
Serial Number	HJ-2457
Part Number	HC-E4A-31
Hours Since New	443.34
Hours Since Overhaul	Not Reached

1.7. Meteorological Information

1.7.1 The weather information in the table below was sourced from the Meteorological Aerodrome Report (METAR) that was issued for FAOR by the South African Weather Service (SAWS) on 10 March 2023 at 0900Z.

METAR FAOR 100900Z VRB05KT CAVOK 23/15 Q1022 NOSIG=

Wind Direction	VRB	Wind Speed	05kt	Visibility	9999m
Temperature	23°C	Cloud Cover	Nil	Cloud Base	Nil
Dew Point	15°C	QNH	1022hPa		

1.8. Aids to Navigation

1.8.1. The aircraft was equipped with standard navigational equipment as approved by the Regulator. There were no records indicating that the navigational equipment was unserviceable prior to the serious incident.

1.9. Communication

1.9.1 The aircraft was equipped with a standard communication system as approved by the Regulator. There were no recorded defects with the communication system prior to the serious incident. The crew was in communication with FAOR ATC ground on frequency 121.9 Megahertz (MHz).

1.10. Aerodrome Information

1.10.1. The serious incident occurred at India taxiway near C19 at FAOR.

Aerodrome Location	Kempton Park, Gauteng Province
Aerodrome Status	Licensed
Aerodrome GPS coordinates	26°08'.00" South, 028°14'.05" East
Aerodrome Elevation	5 558ft
Runway Headings	03L/21R 03R/21L
Dimensions of Runway Used	4 421m x 60m 3 405m x 60m
Heading of Runway Used	India taxiway
Surface of Runway Used	Asphalt
Approach Facilities	Runway lights, PAPI, DVOR / DME (JSV), ILS LOC and ILS GP for both runways
Radio Frequency	121.9 MHz, 124.5 MHz, 128.30 MHz, 118.600 MHz

1.10.2. Taxiway India has a yellow centreline; the distance from taxiway India to the safe zone is approximately 24 metres. The distance from taxiway India to where the tug was parked (in front of the aircraft) was approximately 6.5 metres (inside the box marked C19).

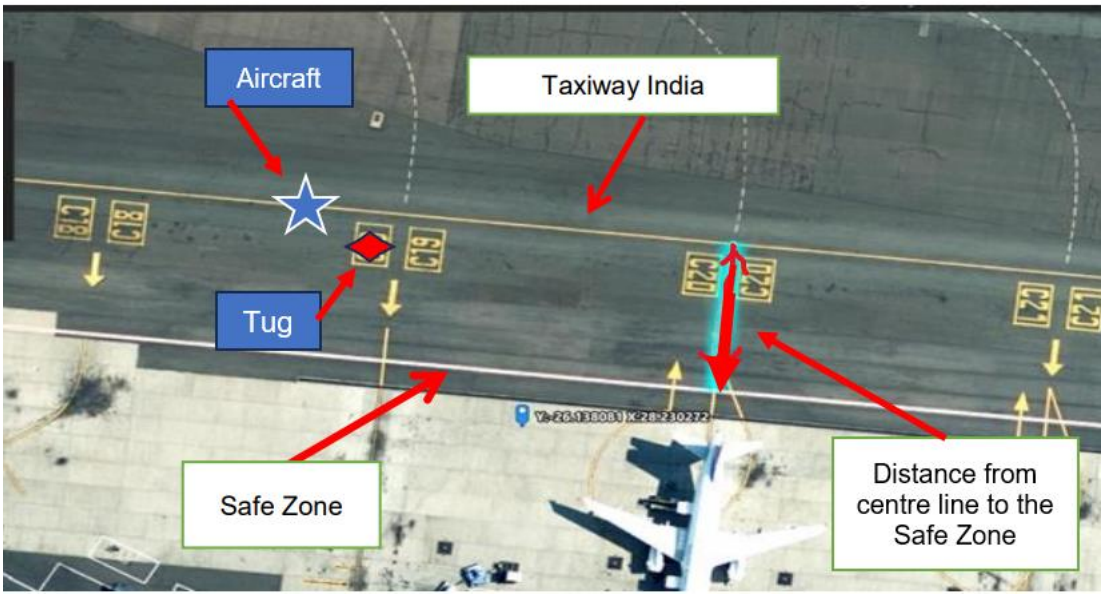


Figure 5: C19 layout at FAOR.

1.11. Flight Recorders

1.11.1 The aircraft was equipped with a flight data recorder (FDR) and a cockpit voice recorder (CVR) as required by regulation to be fitted to the aircraft type. The FDR and the CVR circuit breakers (CBs) were removed to protect the information. The recorders were removed from the aircraft on 10 March 2023.

1.11.2 The FDR transcript was successfully downloaded on 15 May 2023 at an approved AMO in the presence of the investigator. The Number 1 and 2 engine parameters below indicate that both engines were running normally at the time of the incident.

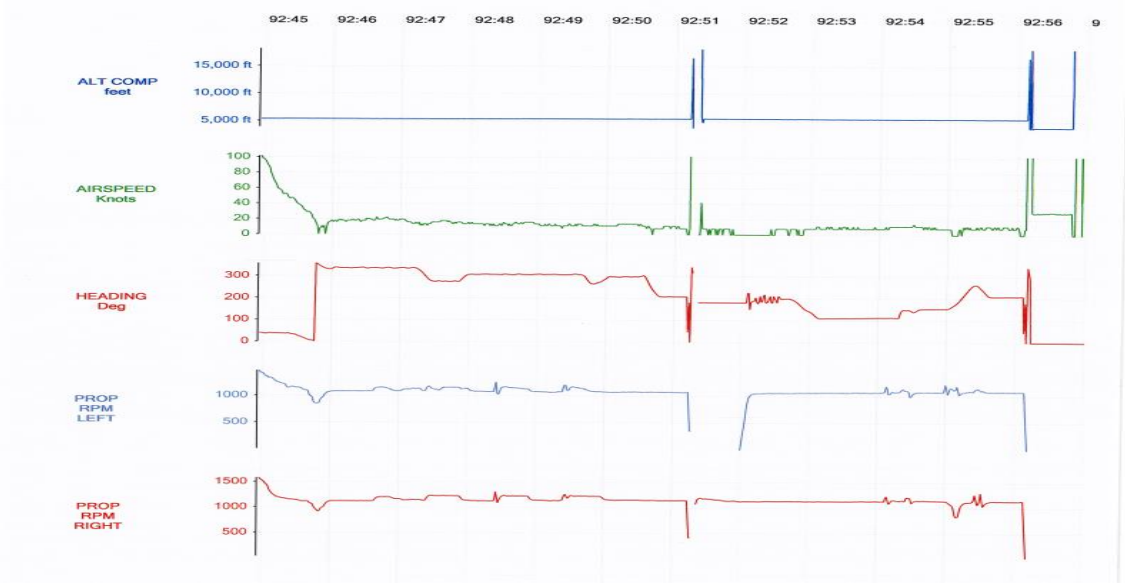


Chart 1: The 1 and 2 engine parameters. (Source: AMO)

1.11.3 The CVR transcript could not be downloaded as it was an old type and the AMO did not have the tools to download it. Also, the CVR could not be sent to the manufacturer to be downloaded as its supplemental type certificate (STC) could not be found.

1.12. Wreckage and Impact Information

1.12.1. During the second turnaround, the aircraft was parked at C19, and both engines were started whilst it was being pushed back to taxiway India. The aircraft faced a heading of 198º. After the tow bar was disconnected and the tug was still parked in front of the right wing, the aircraft was taxied (started to move) at a ground speed of 7 knots (kts) and it impacted the right back corner of the stationary tug with its right-wing tip. It came to a full stop facing a heading of 225º. The aircraft's right wing and the tug were substantially damaged.

1.12.2. Following the serious incident, the operator grounded the aircraft for inspection and repairs.

Figure 6: The aircraft after the serious incident.

1.13. Medical and Pathological Information

1.13.1. None.

1.14. Fire

1.14.1. There was no evidence of a pre- or post-impact fire.

1.15. Survival Aspects

1.15.1. The serious incident was considered survivable as no damage was caused to the cockpit and the cabin structure.

1.16. Tests and Research

1.16.1. None.

1.17. Organisational and Management Information

1.17.1. The flight was conducted in accordance with the provisions of Part 135 (Commercial) of the CAR 2011 as amended.

1.17.2. The AMO that certified the last maintenance inspection (fourth phase inspection) prior to the serious incident flight had an AMO certificate that was issued by the Regulator (SACAA) on 2 March 2023 with an expiry date of 31 March 2024.

1.17.3. The AMO that conducted the downloads of the flight recorders was approved to carry out the duties and had a valid certificate.

1.17.4. The operator was in possession of an approved Class 1 Air Service Licence for domestic schedule, which was issued on 6 October 2022 by the Department of Transport. The licence authorised the carrier to operate under the following categories: Type S1 – transport of passengers between two or more specified points, and Type S2 – transport of cargo or mail between two or more specified points.

1.17.5. The operator had an Air Operating Certificate (AOC) Part 135 which was issued on 23 November 2022 by the SACAA with an expiry date of 30 November 2023. The aircraft was authorised to operate under the AOC.

1.17.6. The operator was sent an email requesting the qualifications of the serious incident aircraft crew and the ground crew with regards to marshalling hand signals (ZS-PKB).
This is the operator's response:

- *We do not allocate specific training for pushback and marshalling. We simulate as much as we can in the simulator and expose the candidates to procedures, signs and call outs during LFUS.*

1.18. Additional Information

1.18.1. The following information is an extract from the operator's Ground Operations Manual (GOM) Document No: CEM-GOM-02/0522/06.
Edition: 2
Revision: 6
Revision Date: 1 July 2022

9.13.17 INTERPHONE COMMUNICATION FAILURE

Aircraft pushback requires a communication interphone. In the event the interphone becomes unserviceable, or communications is lost, the following procedure must be followed: a. In case of a single person operation and if no other means of communication are available, stop the movement (depending on local situations and regulations) and immediately request assistance to continue the movement. b. In case of multiple person operation then communication with the flight crew will be established using hand signals as described in this chapter. The tractor driver must be able to receive the visual signals as relayed from the flight crew. Once hand signal communication has been established the pushback can resume.

9.13.10.5Tractor Driver The pushback tractor driver will: 1.align the tractor or tractor and towbar combination with the centre line of the aircraft before the aircraft movement; 2. completely raise the towbar wheels before the start of the aircraft movement (if used); 3.standby for clearance to push communication from flight crew or responsible ground crew; 4.select appropriate gear on tractor and slowly begin movement; 5. prior to the aircraft movement, make sure that the parking brakes are released and the anticollision lights are

switched on (depending on the local airport regulations); 6.start the pushback operation on a straight line; 7.keep the manoeuvring speed to a minimum, and apply the vehicle brakes gently; 8.scan the apron during pushback, monitor clearances and wing walkers (if applicable) to ensure that aircraft is moving clear of all obstructions. Be prepared to stop; 9.ensure during pushback the steering turn limits are not exceeded and advise flight crew if any are exceeded. Damage to nose gear will occur. Refer to CemAir's Ramp Manual for the specific limits and how they are marked on the aircraft; 10.If responsible ground crew on interphone is walking on ramp, maintain visual contact and ensure a safe distance is maintained from the nose gear during entire pushback; 11. be stopped and a review of the required safety clearance conducted. 12.set brakes on the tractor once pushback is completed; 13. Maintain the brakes on the pushback until the release signal is received from the flight crew or responsible ground crew on interphone.

ANGER: *Do not disconnect the interphone communication cable until after the towbar (or towbar less tractor) has been disconnected from the nose gear.*

9.13.10.3Ground Crew in Charge of Pushback

9.13.10.3.1 GROUND CREW RESPONSIBILITY

The responsible ground crew is defined as the person performing the communications with the flight crew. A responsible ground crew must be in charge of each aircraft pushback. This function can be performed by different agents in different roles and positions. Refer to the operating airline's GOM for the specific assignment of this duty. Responsible ground crew for the departure will:

a. *be in charge of the entire pushback, once clearance to begin pushback has been given by the flight crew;*

d. *conduct briefings with all persons involved in the aircraft movement to review and confirm how the aircraft will be manoeuvred; Ensure the driver of the tug has been brief not to exceed the aircraft turn limits by monitoring the markings on the nose gear.*

q. *signal "All Clear" to pushback tractor driver and wing walkers (if applicable) once advised by flight crew that the aircraft brakes have been released and clearance for pushback given by ATC;*

v. *Give visual signal to the tractor driver and wing walkers (if applicable) that it is clear to*

w. disconnect towbar after flight crew advises that engines were started normally and the ramp is clear to disconnect the towbar.

z. After headset, towbar and steering bypass pin are removed, close and latch all access panels and *then move to designated position to conduct final departure marshalling. Show the steering bypass pin to the flight crew and give the "All Clear to Taxi" signal*.

All Clear to Taxi / All Clear

Give the "All Clear to Taxi" signal once eye contact has been made with the flight crew and they are expecting the signal. In low-light conditions the flight crew will turn on the interior lights of the flight deck. Remain in position until an acknowledgement from the flight crew is received and the aircraft begins to taxi.

9.9.4 MARSHALLING HAND SIGNALS (FOR AIRCRAFT)

Do not perform aircraft marshalling unless it is permitted by the local airport authority and you have been trained and authorised.

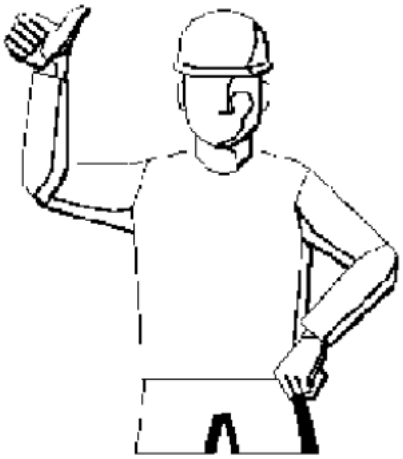
If hand signals are used:

a. *Display the "Set Brakes" hand signal;*
b. *Receive confirmation from the flight crew when they display the "Brakes" hand signal in response:*
   Display the "Chocks Removed" hand signal;
c. *Receive agreement of the flight crew when they display the "Chocks Removed" hand signal in response.*
   If the flight crew does not acknowledge hand signals by repeating them, do not remove the chocks.

OK. All is Clear

Or Continue by Your Own

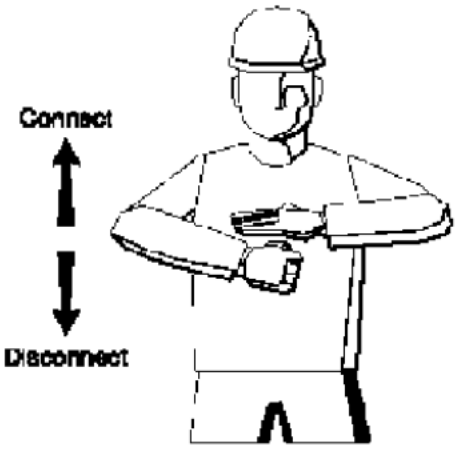
Or Drive Away:



Lift stretched right arm, hand closed, thumb raised.

Chocks Removed; Stabilizers Off:

To Connect or Disconnect:

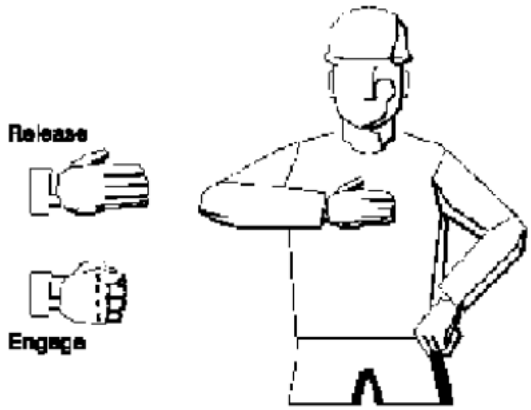


Raise left arm and hand, with fingers extended horizontally.

Connect: Right hand with clenched fist moving upward to contact left palm.

Disconnect: Right hand with clenched fist leaving left palm downward.

Brakes On/Off:



Right arm and hand raised horizontally in front of body.

Release brakes: With fist clenched, then extend fingers, palm inward.

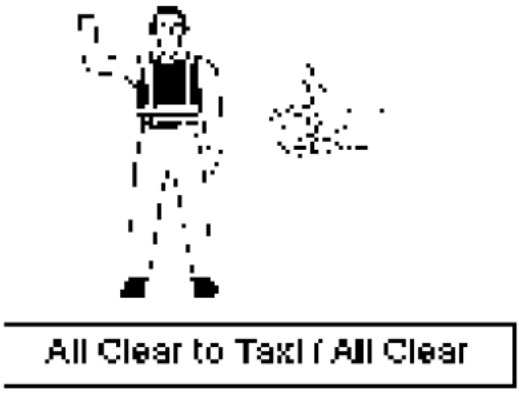
Engage brakes: With extended fingers, palm inward, then clench fist.

v. *Give visual signal to the tractor driver and wing walkers (if applicable) that is clear to*

w. *disconnect towbar after flight crew advises that engines were started normally and the ramp is clear to disconnect the towbar.*

z. *After headsets, towbar and steering bypass pin are removed, close and latch all access panels and then move to designated position to conduct final departure marshalling.*

Show the steering bypass pin to the flight crew and give the "All Clear to Taxi" signal.



Give the "All Clear to Taxi" signal once eye contact has been made with flight crew and they are expecting the signal.
In low light conditions the flight crew will turn on the interior lights of the flight deck.
Remain in position until an acknowledgement from the flight crew is received and the aircraft begins to taxi.

The information below is an extract from the Airports Company South Africa (ACSA) Training Academy Booklet

Marshalling signals recognised by the International Civil Aviation Organisation (ICAO)/SACAA
Section 5, states the following;

No person shall guide an aircraft unless trained, qualified and approved by the appropriate authority to carry out the functions of a signalman.

1.19. Useful or Effective Investigation Techniques

1.19.1. None.

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. Flight Crew Qualifications

The flight crew was properly licensed and qualified IAW the Regulator's (SACAA) regulations and requirements; however, the flight crew was not trained on marshalling hand signals for aircraft.

Flight Crew Medical History

The flight crew had valid and current medical certificates in accordance with the Regulator's (SACAA) regulations and requirements.

2.2.2. The tug driver and the ramp controller completed the airside courses; however, they were not trained on marshalling hand signals for aircraft.

2.2.3. Aircraft Mechanical Conditions

The aircraft was properly certificated, equipped and maintained by an approved AMO IAW the manufacturer's specifications. There were no recorded defects prior to the serious incident. No evidence was found which indicated structural, engine or system failures before the serious incident occurred.

2.2.4. Operational Factors

At the time of the serious incident, the captain was the PF, and the first officer was the PM. Both crew members were new to the company with no knowledge of FAOR layout and company towing procedures. Assertiveness during startup of the engines and taxi was the most critical demand placed on the flight crew and the ramp controller. Specifically, the crew had to ascertain that there was no foreign object (FOD) or personnel near the engines during engines start up and they had to rely on the ramp controller for areas they could not see; however, the ramp controller could not be seen checking or communicating with the crew or tug driver as per the company GOM through marshalling hand signals. The aircraft had no microphone jack, therefore, the crew and the ramp controller relied on hand signals.

The crew put themselves under pressure by trying to catch up for lost time during refuelling, as a result, they were not aware of the tug that was in front of the aircraft during taxi and did not verify with the ramp controller whether it was safe/clear around the aircraft to taxi.

The operator did not adhere to its GOM and the ACSA's manual which states: "*Do not perform aircraft marshalling unless it is permitted by the local airport authority and you have been trained and authorised".*

2.2.5. During the occurrence of the serious incident, the ramp controller was a few metres away from the aircraft, and was walking towards the safe zone area; he left the tug driver by himself and the aircraft unattended. As a result, the aircraft taxied into a stationary tug that was in front of it. The aircraft's right leading-edge tip was substantially damaged. Following the serious incident, the aircraft was grounded for inspection and repairs.

2.2.6 Fine weather conditions prevailed at the time of the serious incident; the weather had no bearing to the serious incident.

3. CONCLUSION

3.1. General

From the available evidence, the following findings, causes and contributing factors were made with respect to this 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 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 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 incident occurring, or would have mitigated the severity of the consequences of the 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

3.2.1. The PF had an ATPL that was issued on 8 September 2022 with an expiry date of 30 September 2023. The aircraft type was endorsed on his licence. The PF had a Class 1 aviation medical certificate that was issued on 23 November 2022 with an expiry date of 30 November 2023 with no medical waivers. Therefore, the PF was appropriately qualified and medically fit to undertake the flight. However, he was not trained for marshalling hand signal for aircraft.

3.2.2. The PF had completed the CRM course.

3.2.3. The PM had an ATPL that was issued on 29 July 2022 with an expiry date of 31 August 2023. The aircraft type was endorsed on his licence. The PM had a Class 1 aviation medical certificate that was issued on 29 June 2022 with an expiry date of 30 June 2023 with no medical waivers. The PM was appropriately qualified and medically fit to undertake the flight; however, he was not trained for marshalling hand signal for aircraft.

3.2.4. The PM had completed the CRM course.

3.2.5. Both crewmembers were new to the company and did not know the layout of the airport and company towing procedure.

3.2.6. The tug driver and the ramp controller completed the airside courses; however, they were not trained on marshalling hand signals for aircraft.

3.2.7. The flight was conducted IAW the provisions of Part 135 of the CAR 2011 as amended.

3.2.8. The aircraft was first registered to the current owner on 26 April 2013. The aircraft was initially issued the C of A on 15 December 2004. The latest C of A was issued on 29 August 2022 with an expiry date of 29 August 2023. The aircraft was reissued a CRS on 19 February 2023 with an expiry date of 19 February 2025 or at 37 911.41 airframe hours, whichever occurs first.

3.2.9. The operator had an approved Class 1 Air Service Licence for domestic schedule that was issued on 12 August 2015 by the Department of Transport. The licence authorised the carrier to operate under the following categories: Type S1 – transport of passengers between two or more specified points, and Type S2 – transport of cargo or mail between two or more specified points.

3.2.10. The operator had an AOC that was issued by the Regulator (SACAA) on 23 November 2022 with an expiry date of 30 November 2023.

3.2.11. The AMO that conducted the FDR downloads had a valid certificate to conduct downloads.

3.2.12. The CVR was not downloadable.

3.2.13. The AMO that certified the last fourth phase inspection (A-check) prior to the accident flight had an approved AMO certificate that was issued by the Regulator on 2 March 2023 with an expiry date of 31 March 2024. The last phase inspection (A-check) was conducted on 19 February 2023 at 37 711.41 airframe hours. The aircraft had accumulated an additional 44.05 airframe hours in operation since the last inspection.

3.2.14. The aircraft was pushed back from parking bay C19 to taxiway India, thereafter, the towbar was disconnected from the aircraft and reconnected to the tug. The aircraft taxied into a stationary tug that was in front of it. The aircraft's right leading-edge tip was substantially damaged. Following the serious incident, the aircraft was grounded for inspection and repairs.

3.2.15. Fine weather conditions prevailed at the time of the serious incident. The weather had no bearing to this serious incident.

3.3. Probable Cause/s

3.3.1. The aircraft taxied into a stationary tug, which resulted in damage to the right wing due to minimal clearance.

3.4. Contributory Factors

3.4.1. Lack of communication between the ramp controller and the tug driver.

3.4.2. Lack of communication between the ramp controller and the flight crew.

3.4.3. The ramp controller forgot his responsibilities during the disconnection of the towbar from the aircraft, which was to ascertain that everything is clear (no obstruction) around the aircraft before leaving the aircraft and signalling to the flight crew that they could start taxiing.

3.4.4. The flight crew was in a rush to make up time as they were delayed.

3.4.5. Lack of training of the crew on-board and on ground.

3.4.6. The pilot flying had low hours on the aircraft on type.

3.4.7. Lack of visual awareness by crew.

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 Message

4.2.1. The operator should adhere to their standard operating procedures (SOP) as approved by the Regulator (SACAA) at all times.

5. APPENDICES

5.1 None.

This report is issued by:
Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa