

AIRCRAFT ACCIDENT REPORT
Caribbean Airlines/Fly Jamaica ground collision.

FINAL REPORT



GENERAL INFORMATION:

GROUND COLLISION BETWEEN CARIBBEAN AIRLINES BOEING 737-8HO, 9Y-SXM AND FLY JAMAICA BOEING 767-319ER, N767WA AT CHEDDI JAGAN INTERNATIONAL AIRPORT, GEORGETOWN, GUYANA ON 29th NOVEMBER 2016

REPORT No. GAAIU 3/1/12

This investigation was conducted in accordance with ICAO Annex 13 and therefore it is not intended to apportion blame, or to assess individual or collective liability. Its sole objective is to draw lessons from the occurrence which may help to prevent future accidents. Consequently, the use of this report for any purpose other than for the prevention of future accidents could lead to erroneous conclusions.

Note: - All times in this report are Coordinated Universal Time (UTC) unless otherwise stated. UTC is four hours ahead of Guyana Standard Time (GST).

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Abbreviations and Glossary

AD	Aerodrome
ADO	Airport Duty Officer
AIP	Aeronautical Information Publication
ANS	Air Navigation Services
APU	Auxiliary Power Unit
ATC	Air Traffic Control
CAL	Caribbean Airlines Ltd.
CHEC	China Harbour Engineering Company (Contractors carrying out expansion works at CJIA)
CJIA	Cheddi Jagan International Airport
CVR	Cockpit Voice Recorder
FJ	Fly Jamaica
GAAIU	Guyana Aircraft Accident Investigation Unit
GCAA	Guyana Civil Aviation Authority
GARs	Guyana Aviation Requirements
ICAO	International Civil Aviation Organisation
JFK	John F. Kennedy Airport (New York)
NTHS	New Timehri Handling Services
NTSB	National Transportation Safety Board (USA)
SARPs	Standards and Recommended Practices
SMS	Safety Management System
SYCJ	ICAO assigned code to CJIA
TTCAA	Trinidad and Tobago Civil Aviation Authority
TXY	Taxiway
UTC	Coordinated Universal Time

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SYNOPSIS.

The Caribbean Airlines Boeing 737-8HO aircraft landed on runway 06 at Cheddi Jagan International Airport, (CJIA) Guyana after a flight from John F. Kennedy (JFK) International Airport, New York. The aircraft was cleared by Air Traffic Control (ATC) to taxi to the International Apron via taxiways Charlie and Alpha, but the crew taxied via Charlie and Bravo (see Fig. 2.).

As the B737 taxied into the International Apron its right winglet struck the tail of the parked Fly Jamaica Boeing 767-319ER, damaging both elevators and the tail cone.

There was no other damage.

There were no injuries.

There was no fire.

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1. FACTUAL INFORMATION

1.1. History of the flight.

Caribbean Airlines Flight BW 527, a Boeing 737-8HO (B737) aircraft, departed from JFK airport, New York, on a scheduled flight to Cheddi Jagan International Airport (CJIA), Georgetown, Guyana at 07:20hrs, on 29th November 2016.

The crew reported that the flight preparation was normal, as were the departure, en-route and arrival sections of the flight.

The aircraft landed on runway 06 at CJIA at 11:33hrs, on 29th November 2016, in daylight, and was cleared by ATC to taxi via taxiways Charlie and Alpha to the International Apron (see Fig. 2).

However, the B737 turned right onto taxiway Bravo, then turned left on to the apron and taxied behind the Fly Jamaica Boeing 767 parked in Parking Position 3 (see Fig. 2). There was a wing walker on the ramp ahead, at the tail end of Parking Position 1 near to taxiway Alpha, another wing walker was standing by the tail of the B767 in Parking Position 3, and a marshaller was at the head of Parking Position 2.

At 11:36hrs, as the B737 taxied behind the B767, the right “winglet” of the B737, a vertical section at the tip of the wing, 8 feet tall, nicked the trailing edge of the B767’s right elevator, cut off the tail cone and sliced through the left elevator (see Section 6: Photographs).

The B737 then came to a halt and the captain shut down the engines.

1.2. Injuries to persons.

There were no injuries to passengers, crew or others.

1.3. Damage to aircraft.

The right winglet of the B737 was damaged by contact with the B767’s elevators and tail cone, to the extent that it had to be replaced.

The left and right elevators of the B767 were damaged and the tail cone was sheared off by the right winglet of the B737 (see Section 6: Photographs). The B767 has an Auxiliary Power Unit (APU), a small gas turbine-powered generator, in the tail of the aircraft, and this was running at the time of the accident. Its exhaust pipe in the tail cone was torn off, but the APU itself was not damaged.

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1.4. Other damage.

There was no other damage.

1.5. Personnel Information.

(Note, this is for the Caribbean Airlines B737 only, as the Fly Jamaica B767 was parked with engines shut down.)

1.5.1. CAPTAIN – Pilot Not Flying

Age: 60 years.

Airline Transport Pilot License, Trinidad and Tobago.

Medical: valid with no restrictions.

Total Flight Hours: 14,738

Flight Hours on B737: 6,256

Flight Time: Last 24 hours - 5:13hrs; Last 7 days - 13:18hrs; Last 90 days - 104:35hrs;

The Captain had been off-duty on 25th and 26th November, then had flown to JFK on 27th November, and had 36 hours rest at JFK before the flight to CJIA on 29th November.

The Captain's Flight/Duty/Rest hours were within the approved company limits.

The Captain was qualified to serve as flight crew on the aircraft at the time of the accident.

Types flown: B737, B767, MD-83, L1011.

Years operating into CJIA: 26.

1.5.2 FIRST OFFICER – Pilot Flying

Age: 52 years.

Airline Transport Pilot License, Trinidad and Tobago.

Medical: valid with no restrictions.

Total Flight Hours: 7,600.

Flight Hours on B737: 4,100.

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Flight Time: Last 24 hours - 5:13hrs; Last 7 days - 10:49hrs; Last 90 days - 153:23hrs.

The First Officer had flown on 22nd November; was on medical leave from 23rd to 25th November; off-duty on 26th November and had 36 hours rest at JFK before the flight to CJIA on 29th November.

The Medical Leave was due to a back injury.

The First Officer's Flight /Duty/Rest hours were within the approved company limits.

The First Officer was qualified to serve as flight crew on the aircraft at the time of the accident.

Types flown: B737, B767, DHC-8, light aircraft.

Times landed at CJIA: 364.

1.5.3. Wing walkers/Marshalls.

The wing walkers/marshalls had all been trained in accordance with the training programs of Caribbean Airlines Limited (CAL) and New Timehri Handling Services (NTHS).

They had commenced duty at 10:30hrs that morning, so had been on duty for only 1 hour and 6 minutes at the time of the accident.

1.6. Aircraft Information.

1.6.1. Caribbean Airlines (CAL).

Aircraft Type -Boeing 737-8H0

Serial Number - 37935

Registration - Trinidad and Tobago 9Y-SXM

Certificates of Airworthiness and Registration - valid

Owner - Osprey Aircraft Leasing (US-TWO) LLC

1.6.2 Fly Jamaica (FJ).

Aircraft Type - Boeing 767-319ER

Serial Number - 24876

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Registration - USA N767WA

Certificates of Airworthiness and Registration - valid

Owner - Wings Aviation Inc.

1.7. Meteorological information.

Sunrise on the day of the accident was at 09:48hrs.

The accident occurred at 11:36hrs, during the hours of daylight.

The weather at the time of the accident was wind from the southeast at 4 knots, visibility more than 10 kilometers, temperature 26° Celsius, scattered cloud.

1.8. Communications.

The only abnormality in communications was the First Officer's misunderstanding of the taxi instructions, as described in 1.13.3.

1.9. Airport information.

1.9.1. Aeronautical Information Publication (AIP) Guyana.

The AIP Guyana, Aerodrome Chart – ICAO, states (see Fig. 2):

Cheddi Jagan Int'l/Timehri (SYCJ), Georgetown, Guyana

N6 29 56.15 W058 15 15.67

Elevation 96 feet above mean sea level.

There were four runways, 06/24 which was 7,448 feet in length, and 11/29, which was 5,002 feet in length.

1.9.2. Airport Operator / Aerodrome Manual

The airport was operated by the Cheddi Jagan International Airport Corporation (CJIAC). The Airport has an Aerodrome Manual which is approved by the GCAA.

The Airport Operations Division, Safety Management and Training is responsible for airside operations. The Safety Management and Training Section of this division is responsible for

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developing training that will ensure the required safe practices for the airport and particularly for airside operations. The Deputy Manager, Airport Operations, is the person who has overall responsibility for aerodrome safety. The manual states that the Safety Management System (SMS) is established to ensure compliance with all safety requirements and to achieve continuous improvement in safety performance.

The manual states that:

“Safety of operations at CJIA is the most important objective of the CJIA Corporation.”

The manual also notes that:

“... certification requirements shall be met or exceeded and all activities at CJIA shall be conducted with safety of all persons, property, equipment and facilities being given the highest priority.”

The manual states that membership of the Airport Operations Committee and the Airport Safety Committee is the same and includes representatives from airlines, aircraft operators, handling agents and Air Navigation Services, among others.

Responsibility for safe parking, marshalling and movement of aircraft on the apron has been devolved to airlines.

1.9.3. The International Apron.

1.9.3.1. Parking Positions.

The International Apron, located in the eastern section of the airport, has four Parking Positions, designated Parking Position 1, Parking Position 2, Parking Position 3 and Parking Position 4 (see Fig. 2).

Normally, aircraft taxiing to the International Apron come along taxiway Charlie, and exit on taxiway Alpha or Bravo to the International Apron.

Parking Position 4 is 27 Ft. longer than the other Parking Positions (see Fig. 2 and 1.9.3.3).

1.9.3.2. Published Apron Procedures.

Published apron procedures for the International Apron, valid at the time of the accident, are described in the publication “AIRSIDE DIRECTIVES”, prepared by the CJIA Airport Operations Manager, dated March 2009 (see Fig. 1).

This included the directive in paragraph 10.4:

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*“When the B767 is parked on Parking Position 1, other aircraft wishing to park in Parking Positions 2, 3 or 4 shall access the apron via taxiway Bravo. Alternatively, when the B767 is parked on Parking Position 4, other aircraft wishing to park in Parking Positions 1, 2, or 3 shall access the apron by taxiway Alpha. **Large aircraft should not taxi behind a parked B767** (bolding added).”*

The Airside Directives also stated in paragraph 10.4:

“Parking Positions shall be allocated by the Airport Duty Officer. Prior to the arrival of the Aircraft, Operators shall coordinate with the Airport Duty Officer who will allocate the Parking Positions to be used. Such coordination must be effected at least one hour prior to the estimated arrival of the Aircraft.”

The management of CAL and FJ reported that the “AIRSIDE DIRECTIVES” had not been received, and they were not aware of the directive “*Large aircraft should not taxi behind a parked B767*”. NTHS management had received a soft copy of the “AIRSIDE DIRECTIVES”, but was not aware of the directive “*Large aircraft should not taxi behind a parked B767*”.

The Guyana AIP page - AD 2.1-9, dated 26 May 16, Aerodrome Chart – ICAO (see Fig 2), stated:

PARKING RESTRICTIONS. All aircraft shall be parked in a nose-in position. All parking positions may be used for any aircraft size. Position 4 for cargo aircraft (preferable).

TAXIING RESTRICTIONS. Two-way radio required. When Position 1 is occupied, other aircraft shall access the apron via TWY Bravo (B). Alternatively, TWY Alpha (A) may be used by: -DHC or smaller aircraft under own power, -Larger aircraft under tow.

The Jeppesen airport chart 10-9 for SYCJ/GEO, Georgetown, Guyana, Cheddi Jagan Intl, dated 29 JUL 16 (see Fig. 3), which was reported to be the one used by the crew of BW 527, stated the following:

PARKING RESTRICTIONS. All aircraft shall be parked in a nose-in position. All parking positions may be used for any aircraft size. Position 4 for cargo aircraft (preferable).

TAXIING RESTRICTIONS. Two-way radio required. When Position 1 is occupied, other aircraft shall access the apron via TWY Bravo (B). Alternatively, TWY Alpha (A) may be used by: -DHC or smaller aircraft under own power, -Larger aircraft under tow.

If position 1 is occupied by 767, taxiway Alpha between the apron and taxiway Charlie shall be closed to all other aircraft. Movement of aircraft to and from the apron shall be via taxiway Bravo.”

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Note: There was no mention in the above information of the fact that both B767-200 and B767-300 aircraft operate into CJIA, and that the B767-300 is 21 feet longer than the B767-200, thus creating a greater ground collision hazard.

1.9.3.3. Parking Position Allocation.

The CJIA Management provided the following information:

- The Airport Duty Officer (ADO) was responsible for allocating parking positions on the International Apron to arriving aircraft.
- The ADO had a combined flight schedule which had the airline, flight number, aircraft type, and route for each day. If there was to be a change in the schedule, the operator would advise the ADO. For itinerant flights, the control tower would normally advise the ADO, including the aircraft type.
- ADOs were instructed to assign parking positions based on arrival/departure time and aircraft type and to avoid mixing arriving and departing passengers on the ramp. ATC was advised only if a special parking arrangement was required, otherwise aircraft were told by ATC to look for the marshaller. The ADO would inform the operator of the flight's allocated parking position, and the marshalls and pilots were advised accordingly.
- On occasions, ATC would contact the ADO if there was no marshaller for the aircraft. Otherwise ATC was not informed of the allocated parking positions, and did not advise incoming aircraft regarding this.
- The ADO's training program and training records were requested but were not forthcoming.

At the time of the accident, the Fly Jamaica B767, which had arrived at 10:31hrs and was scheduled to depart at 13:30hrs, was in Parking Position 3. Parking Position 4, which was vacant, was assigned to Dynamic Airways, which had a B767 scheduled to arrive at 12:30hrs and remain on the ground all day. Parking Position 1 was occupied by another CAL B737.

The Fly Jamaica aircraft was a B767-319ER, which had fuselage; 21 feet longer than B767-200 series, which also operated at CJIA. The ADO reported that he was not aware of the different fuselage lengths of the 200 and 300 series B767s.

The ADO was not aware that there was insufficient room for a B737-800 to taxi behind a B767-300 parked in Parking Positions 2 and 3.

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The ADO did not make any decision, or give any instructions, regarding the taxi route that any aircraft took to the International Apron.

In the ADO's office, was a whiteboard upon which the times of flights occupying Parking Positions 1 to 4 were recorded. However, these were not represented on a layout plan of the International Apron, and so did not give the ADO a clear perspective of the arrangement of the aircraft. Also, the aircraft were represented by Flight Number, therefore the ADO did not know, at a glance, what was the aircraft type without consulting the combined flight schedule. Even then, he did not know that the B767-300 was 21 feet longer than the B767-200.

The ADO reported that he was aware of the AIRSIDE DIRECTIVES document, and the statement therein stating: "*Large Aircraft should not taxi behind a parked B767.*"

Although none was marked, the approximate nose-wheel point of Parking Position 4 (i.e. towards the terminal building) was about 27 feet further towards the terminal building than those of the other parking positions, which meant that, if parked correctly, the tail of an aircraft in Parking Position 4 was approximately 27 feet farther away from the aircraft taxiing from Bravo to the other parking positions (see Fig. 2), or exiting the International Ramp from Parking Positions 1, 2, or 3 via Bravo.

1.9.3.4. International Apron Ramp Services.

ICAO Doc 9137 – AN/898 Part 8, Airport Operational Services, First Edition – 1983, states in paragraph 2.2.3.3 (c):

Typical responsibilities of an Apron Management Unit are ... the provision of marshallers for use on aircraft stands without docking guidance systems.

Paragraph 2.2.3.1 states:

*The Airport Operations Section is responsible for the day-to-day **control and organization** (bolding added) of the safe and expeditious movement of aircraft around the airport and to and from the aircraft stands.*

The Guyana Aviation Requirements Implementing Standards: Part 12 – Aerodromes Certification, Part 4, Particulars of the Aerodrome Operating Procedures and Safety Measures, Apron Management, states:

(General information should be provided regarding) particulars of apron management procedures, including ... marshalling service ...

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The Cheddi Jagan International Airport Aerodrome Manual, Part 4 – Aerodrome Operating Procedures and Safety Measures, paragraph 4.9.5 Marshalling Service states:

Aircraft Operators are required to arrange for their own marshalling service which is normally provided by the respective Ground Handling Agencies at CJIA.

NTHS reported that the company had contracts with various operators for the provision of ramp services, one of these being CAL.

NTHS reported that there was no written agreement between NTHS and Cheddi Jagan International Airport Corporation (CJIAC) to operate at the Cheddi Jagan International Airport (CJIA) at the time of the accident.

CJIAC reported that the agreement between CJIA and NTHS was currently with its lawyer.

CJIA also reported as follows:

- (1) The Company (NTHS) has an agreement with CJIAC.*
- (2) CJIAC ensured their (NTHS) employees meet the criteria for a Restricted Area Pass.*
- (3) CJIAC Operations and Security Officers monitor their (NTHS) employees for compliance with the Airport Regulations.*

- (4) Their (NTHS) drivers who are authorized to drive on the Airside of the airport are issued with an Airside Vehicle Operators' Permit (AVOP) after successfully complete the course.*
- (5) Conduct inspection of their (NTHS) vehicles operating on the Airside.*
- (6) Conduct security awareness training with their (NTHS) staff.*

Note: as described above, the evidence indicates that the agreement between CJIA and NTHS was concerning security and vehicle operation, and not about responsibility "... for the day-to-day control and organization of the safe and expeditious movement of aircraft around the airport and to and from the aircraft stands.", as per ICAO SARPs above. CJIA did not provide any training or monitoring of ramp workers at CJIA.

1.10. Ramp Workers Training.

NTHS provided the ramp staff with a "Basic Ramp Training" course. This was supplemented with further training from the various operators, one of which was CAL, to train the ramp staff in accordance with the company's specific procedures. CAL reported that their classroom training

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program was designed as *ab initio*, and did not depend on the NTHS initial training, but that the practical on-the-job training, including marshalling, was conducted only by NTHS.

ICAO Airport Services Manual (Doc 9138), Part 8, Paragraph 8.4.3 Marshalling service, and Paragraph 8.6.4, prescribe the training required for marshallers, including authorized signaling, clearance, wing walkers, emergencies, use of tractors, reflective jackets, safety and aircraft characteristics.

ICAO Annex 2, Paragraph 3.4.4 stated:

*“No person shall guide an aircraft unless trained, qualified and approved by **the appropriate authority** (bolding added) to carry out the functions of a signalman”, and Annex 2, Appendix 1, 5. “Marshalling Signals” shows the marshalling signals to be used.*

Paragraph 10.5.3, Marshalling Service, stated:

10.5.3.1 An airport marshalling service should be provided where self-help guidance systems do not exist or are unserviceable ... Proper training arrangements should exist for marshallers and only those who have demonstrated satisfactory competence should be permitted to marshal aircraft.

The NTHS “Basic Ramp Training” program was examined, and the signals therein were compared with those in ICAO Annex 2. It was found that the NTHS signals were as required, except for Signal 1 - Wing-walker/Guide, which applied to aircraft movement on/off a parking position. Otherwise, the training guide was comprehensive and quite adequate.

There was no evidence of any approval or monitoring process of this NTHS practical, “on the job” marshaller training by CAL, the Guyana Civil Aviation Authority, the CJIA or any other such body.

The CAL program for the training of the NTHS ramp workers who worked on CAL aircraft at CJIA was also examined and it was found to have been approved by the Trinidad and Tobago Civil Aviation Authority.

NTHS produced records indicating that the three ramp workers who were marshalling the CAL aircraft at the time of the accident had completed the NTHS Ramp Training, and were qualified in accordance with CAL ramp training program. This did not include the practical “on the job” marshaller training, which was done by NTHS, and which was not monitored or approved by any other body.

The training and qualifications of the trainers was also examined and found to be satisfactory.

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1.11 Procedures on the International Apron.

The investigation revealed that there were some “unofficial procedures” on the International Apron.

1. There was evidence that B737 aircraft taxiing in, on taxiway Charlie from the east for Parking Positions 1 or 2 would occasionally exit on Bravo in order to reach Parking Positions 1 or 2 more quickly than taxiing to Alpha and would ignore the instructions to continue on Charlie to Alpha. For this reason, a marshaller would often be placed at Bravo to signal an aircraft to continue on Charlie to Alpha.
2. When B737 aircraft taxied behind parked B767 aircraft, there was an “unofficial procedure” where the marshaller directed the aircraft to deviate to the pilot’s left to provide clearance between the right wing of the B737 and the tail of the B767. This “unofficial procedure” was known to the management of NTHS, but there was no indication that NTHS had tried to prevent it. The evidence also indicated that CAL and other airlines’ management, and CJIA management, were unaware of this “unofficial procedure”. It was reported that some pilots complained at having to deviate from the apron lead-in line, when passing behind a parked B767.

The only time there was a risk of collision between a B737 and a B767 was when a B767-300 model, with extended length fuselage, as was Fly Jamaica’s B767-319ER, was parked in Parking Positions 1,2 or 3, and the aircraft attempting to taxi behind it was a B737-800, fitted with winglets. This assumes that the B767 was parked in the correct position, and the nose of the B737 was on the apron lead-in line. Parking Position 4 was 27 feet deeper than the other positions, so in that position the parked B767-300’s tail was further from the taxiway, and did not present a hazard. Otherwise, when parked in Parking Positions 1, 2 or 3, the shorter B767-200’s tail would not protrude far enough, beyond its parking position, to conflict with the winglet of a B737-800, or the wingtip of an earlier model B737 without winglets, such as those of Suriname Airways. These would clear the tail of the longer B767-300 without striking it.

1.12. CAL B737 Flight Crew’s Visibility.

1.12.1. Visibility from Captain’s seat.

As the CAL B737 aircraft taxied past the tail of the B767, with the B767 on its right, the visibility from the Captain’s seat, on the left side of the cockpit, was limited to directly at 90° to the right, and was partly obscured by the First Officer’s head. Thus, the right winglet was not visible from the Captain’s seat.

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1.12.2. Visibility from First Officer's seat.

From the First Officer's seat on the right-hand side of the cockpit, it was possible for the First Officer to turn his head sharply to the right, looking back about 140° to the right, out of the most aft of the three cockpit windshield panels, known as the Right-Hand Number 3 Windshield Panel. Through this panel the First Officer could see the end of the aircraft's right wing, and the right winglet.

1.12.3. Windshield heating.

Provision for heating the Right-Hand Number 3 Windshield Panel was an option on the B737-800, but this aircraft was not so equipped. When the First Officer looked back to see the winglet, just prior to the impact, he was unable to see through the Right-Hand Number 3 Windshield Panel as it was "completely frosted to translucence".

Boeing Commercial Aviation Services reported:

"The number 3 window can be heated or non-heated on the 737NG. This is an optional feature and is not required by regulations. If it is installed, MMEL 30-11-05 shows that it can be inop. without any Mx/Operational restrictions. Most of the operators that request the heated glass window operate in cold climates and want the heated window for crew comfort.

CAL reported that some of its B737s were equipped with the heated Right-Hand Number 3 Windshield Panel as an option, and some were not so equipped.

1.13. Recorded Information.

1.13.1. Information from Closed Circuit TV Security Cameras.

1.13.1.1. Camera # 4, Wing walker C.

Camera "Parking # 4", scanning north end of International Apron from northeast corner looking south towards Taxiway Bravo.

Note: Wing walker C did not signal the B737 to continue on Charlie to Alpha.

(Hours:Minutes:Seconds, (Local Time):

07:35:00 – Wing walker C at tail of B767, facing South East, towards taxiway Charlie, away from B767, raises left arm 45° upwards.

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07:35:22 - B737 on Taxiway Charlie, heading South West, nose is at Taxiway Bravo. Wing walker C standing behind tail of B767.

07:35:29 - B737 starts to turn right into Taxiway Bravo.

07:35:31 – Wing walker C moves orange safety cone which is under to the tail of B767 with his foot towards the B767, further under its tail, about 6 feet.

07:35:40 – Wing walker C stands beside safety cone with his back to B767, facing southeast, raises right arm out horizontally, and left arm held up at 45°.

07:35:49 - B737 turns left to follow yellow apron lead-in line behind B767.

07:36:06 to 18 – Wing walker C steps backwards five steps towards B767, as nose of B737 passes him, left arm up at 45°, right arm horizontal.

07:36:19 – Wing walker C takes two more steps backwards.

Note: Wing walker C was not looking at winglet of B737 as it approached the tail of the B767.

07:36:21 – Wing walker C's arms both go up (at contact), crossed above his head, as the right engine pod passes him.

07:36:21 - B737's right wing flexes downwards as B737's right winglet strikes B767 right elevator.

07:36:22 - B737 right winglet strikes B767 tail cone, then the left elevator.

07:36:24 – Wing walker C runs northeastward, away from B767 tail.

07:36:26 - Debris from tail of B767 falls to the ground, where wing walker C had been standing.

07:36:30 - B737 comes to a halt.

1.13.1.2. Camera # 2, Wing walker B.

Camera "Parking # 2", scanning south end of International Apron from northwest corner looking south towards Taxiway Alpha.

(Hours:Minutes:Seconds, Local Time):

07:35:00 – Wing walker B is standing at southeast (tail) end of Parking Position 1, near to where Taxiway Alpha meets the International Apron.

07:35:20 – Wing walker B lifts both hands above head, and stands with both hands raised.

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07:35:29 – Wing walker B puts hands down and walks east towards tail end of Parking Position 2 and Taxiway Alpha.

07:36:04 – Wing walker B stops, raises both hands and marshals forward signal.

07:36:12 to 21 – Wing walker B marshals with right hand horizontal, left hand beckoning.

07:36:23 - Wing walker B signals both hands above head, crossed, “Stop”!

1.13.1.3. Camera # 2, Marshaller A.

Camera # 2, Marshaller A, also on Camera “Parking # 2”:

(Hours:Minutes:Seconds, Local Time):

07:36:33 to 07:36:54 - Marshaller A walks to head of Parking Position 2, holding both batons above his head, and continues to walk out along the Parking Position 2 center lead-in line, both hands above head, looking left towards taxiway Bravo.

07:36:54 to 07:37:02 - Marshaller A stands with both hands above head.

07:37:02 - Marshaller A lowers his arms.

1.13.2. Air Traffic Control (ATC) recording.

The ATC recording determined that the B737 was cleared to taxi via taxiways Charlie and Alpha and to look for the marshaller, and that the read back by the flight crew was correct.

1.13.3. Cockpit Voice Recorder (CVR) recording.

The details of the CVR are as follows:

Model: FA2100

PNR 2100-1025022

SER 000688195

MFR 06141

DMF 112010

TSO-C123b

TSO-C177

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ED-112

ARINC-757

The CVR was removed from the aircraft and sent to the NTSB Lab in Washington, DC. for downloading of the audio information.

The CVR recording indicated that, shortly after landing, ATC cleared the aircraft to taxi via taxiways Charlie and Alpha to the International Apron and to look for the marshaller, and that the First Officer's read back was correct. However, one minute and 30 seconds later, and approximately two minutes before impact, as the aircraft was taxiing on Charlie, the Captain asked the First Officer "Where we goin'? Bravo?", to which the First Officer responded affirmatively.

1.14. Medical and pathological Information.

Drug and alcohol tests were not conducted on the flight crew.

Drug and alcohol tests were conducted on the two ramp workers who were responsible for directing the aircraft. The tests were all negative.

1.15. Flight Crew and Wing walker/Marshaller Duty Times.

The captain and first officer reported that they had a 36-hour layover at a hotel in JFK, and they were well rested when they were picked up at the hotel at 03:25hrs.

Both reported feeling well at departure and during the flight.

About 3 hours after arrival, the captain reported to the investigator that he felt tired.

The wing walker/marshaller had started work at 10:30hrs, one hour and 6 minutes before the accident.

1.16. Safety Management System (SMS).

1.16.1. SMS definition.

ICAO Annex 13 states:

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“A safety management system (SMS) is a systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures.”

An integral part of an SMS is the reporting system, with appropriate instructions and forms.

1.16.2. SMS of CAL, CJIA and NTHS.

Both CAL and CJIA had SMSs.

The SMS of CAL was approved by the Trinidad and Tobago Civil Aviation Authority (TTCAA).

The CAL SMS included a Confidential Reporting System, and stated:

“It is the responsibility of every Caribbean Airlines employee to report any circumstances affecting safety ...”

There was a Confidential Report Form.

There was no evidence that any reports had been received by any CAL staff regarding hazards at CJIA.

The SMS Manual of CJIA was approved by the GCAA on 22nd July 2009, and there had been no amendments. This included mention of Confidential Reporting, but did not include any forms for reporting, nor a description of any such procedure. The CJIA Aerodrome Manual, 5th Edition approved by the GCAA on 30 January 2016, Part 5, also described a Safety Management System, but did not include a reporting system, and did not include any reporting forms. CJIA management reported that a revised and up-dated CJIA SMS Manual was in process of preparation, but no evidence was produced to support this.

The GCAA Aerodrome Certification Inspection Checklist, dated 16th November 2016, regarding CJIA stated:

“SMS manual approved on 24th August 2009. Because the aerodrome operator’s SMS is not yet fully operational, its effectiveness is to be assessed during continued oversight and will constitute an important factor in deciding the continued oversight that will be carried out. At SYCJ (i.e. CJIA) where the SMS is not fully operational, full inspections will be conducted by the GCAA”.

There was no evidence of any hazard reports having been submitted to CJIA.

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NTHS had a Quality Service Plan manual, but no SMS *per se*. This manual did not include any mention of a hazard reporting system, and there were no forms for reporting hazards. As this company was not regulated or monitored by CJIA, GCAA or any other body, there was no obligation for it to have an SMS.

1.17. Meeting of CJIA Airport Operations Committee, 14th December 2016.

CJIA conducted a meeting on 14th December 2016 in the CJIA Emergency Operations Center. It was stated that the meeting was prompted as a result of the accident involving CAL and Fly Jamaica on 29th November 2016

The minutes of this meeting recorded that it was attended by representatives from CJIA, NTHS, Fly Jamaica, Caribbean Airlines and Total Air Cargo. Roraima Airways and Laparkan were recorded as being absent. The GCAA and ANS were not invited to this meeting, nor was the GCAA informed of this meeting until after it had taken place.

The following stakeholders at CJIA were not mentioned in the minutes: GCAA, ANS, Suriname Airways, Amerijet, Copa, Fly Always, Insel Air, Dynamic Airways, Guyoil and RUBIS.

The minutes of this meeting were received by CAL on 26th January 2017, received by NTHS on 23rd January 2017, and to date of writing had not been received from CJIA by ANS, Roraima Airways, Suriname Airways, Amerijet, Copa, Fly Always, Insel Air, Dynamic Airways and RUBIS. GCAA received a copy only after requesting it. This copy was shared with the GAAIU

The Purpose and Procedures promulgated in the minutes of this meeting were as follows:

2. Purpose of the Meeting.

2.1 (The CJIA Operations Manager) stated this meeting was prompted as a result of the incident that occurred on the International Apron on 29th November 2016 with CAL & Fly Jamaica aircraft;

2.2 (The CJIA Operations Manager) mentioned that a solution is being proposed to CHEC for extending the International Apron resulting in an additional taxi lane between Taxiways Alpha & Bravo;

3. Procedures to be Implemented

3.1 (The CJIA Operations Manager) stated, ideally, Parking Positions One (1) & four (4) will be used for the parking of Code D aircraft (B 757 and larger) but not together;

3.2 During the busy period a Senior Airport Official or an Airport Duty Officer will make

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Ad hoc checks on the Apron to ensure operators are complying with the parking arrangements;

3.3 Once parking positions 1 and 2 are occupied by a Code D or larger aircraft, taxiing onto the Apron will be prohibited. Also, if a code D or larger aircraft is parked on position 2 or 3, taxiing behind the code D aircraft with an aircraft larger than a Dash 8 is prohibited. Aircraft must be towed;

3.4 All aircraft parking on the Apron must comply with Airside Directives and ensure that the aircraft's nose wheel is parked on the stop line;

3.5 All present indicated they are in possession of a CJIAC Airside Directive;

3.6 When the parking position is agreed upon for an aircraft, the Airport Duty Office must inform the Control Tower and Handling Company;

3.7 It was related that the Airlines and Handlers normally communicate the parking position of the aircraft to the Pilot in Command;

3.8 An Aircraft that is required to be on the Apron for lengthy hours will be repositioned to the South Jet Ramp;

3.9 It was reported the nose wheel line is not marked on parking position four (4). CJIAC will address this issue;

3.10 CJIAC will recirculate the current Airside Directives to all the Operators;

3.11 The following are proposals:

** Pave lawn area between Taxiway Charlie and the International Apron to extend the apron towards Charlie. The section of Charlie between Alpha and Bravo will also be eliminated and converted to apron space;*

** This will split Charlie in two (Charlie 1 & Charlie 2) and will take you straight onto the apron;*

**Shift apron taxi lane towards Taxiway Charlie;*

**This will provide enough space to accommodate a code D B767/300 parked on any position while another code D B767/300 can use the apron taxi lane behind on its own power;*

**Proposal to have apron management be effected by CJIA staff;*

**It was suggested to have a dialogue with ICAO regarding the review of Passenger movement on Apron arrangements;*

There was no evidence from CAL, CJIA or NTHS of any Hazard Reports or suchlike being filed regarding conditions on the International Apron at CJIA.

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1.18. New Timehri Handling Services Inc. (NTHS).

NTHS provided the investigation with the following information:

1. NTHS has no approval or oversight from the GCAA.
2. NTHS management is aware of the unwritten and unapproved practice whereby B737 aircraft are taxiing behind B767 aircraft parked on International Apron. This would only be a problem when the B767 is a long-body version, like that of Fly Jamaica.
3. In that case, the marshallers will direct the taxiing B737 to deviate from the yellow taxi line to the left, to provide clearance between the wing of the B737 and the tail of the B767.
4. NTHS management is not aware of the section of paragraph 10.4 of Cheddi Jagan International Airport Airside Directives, dated March 2009, which states “Large Aircraft should not taxi behind a parked B767.”
5. At the time of the accident, when the B737 was taxiing towards the International Apron on Charlie, the wing walker (Marshaller C) was in the vicinity of the tail of the Fly Jamaica B767.
6. The purpose of him being there was to direct the B737 NOT to exit on Bravo, but to continue on Charlie to Alpha.
7. The wing walker signaled the B737 to continue on Charlie to Alpha, but the aircraft turned into Bravo.
8. Once in Bravo, the aircraft seemed to be heading to park in Parking Position 4, then turned sharply to the left and went behind the B767.
9. The wing walker then moved to stand under the tail of the B767.
10. Wing walker B, who had positioned himself close to where Alpha meets the International Apron, to guide the B737 aircraft in from Alpha, then turned towards the B737 aircraft and started directing it past the B767.
11. Shortly before the accident, wing walker B started to signal the aircraft to turn left.
12. There were some “unofficial procedures” happening at CJIA. B737 aircraft were turning in on Bravo and taxiing behind B767 aircraft, and, if it’s a long body B767, the wing walkers/marshalls had to direct the B737 to deviate off the yellow line to the left.
13. NTHS management was aware of these “unofficial procedures”.
14. The wing walkers/marshalls were not instructed that it was not permitted for large aircraft to taxi behind B767 aircraft parked on the International Apron.
15. The NTHS had a Quality Service Plan, but did not have an approved SMS manual.
16. NTHS gave its ramp workers basic training, and the operators gave further training, which was *ab initio*.

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17. Ramp workers worked only on the aircraft of the company to which they were assigned.
18. The Corrective Action Plan of NTHS was for the company's Ramp Operations employees to attend a Marshalling and Safety Management Systems (SMS) refresher training course.
19. There was no established Irregularity Reporting System for NTHS to make occurrence reports to CJIA.

NTHS and its procedures were not monitored or approved by GCAA or any other body, nor was this required by regulation. NTHS came under GCAA control only as regards Security.

NTHS management was not aware of any CAL personnel monitoring the on-the-job marshalling training that NTHS gave to the marshallers.

The NTHS marshallers had all started duty at 10:30hrs that morning, 1 hour and 6 minutes before the accident.

NTHS management did not document the on-the-job marshalling training that NTHS gave to the marshallers.

NTHS did not have an Agreement of any sort with CJIAC.

1.19 Caribbean Airlines Limited (CAL).

CAL provided the investigation with the following information:

1. CAL provided *ab initio* classroom training to the NTHS marshallers who would marshal CAL aircraft.
2. The marshallers were then given practical, on-the-job marshalling training by NTHS, but this was not documented, monitored or approved by CAL.
3. CAL personnel made routine audits/observations of the ramp workers, including marshalling, and sent reports to the Quality Assurance Department. There were no discrepancies regarding marshalling in the recent reports.
4. CAL management was not aware of the practice of CAL aircraft being directed off the yellow taxi line by NTHS marshallers.
5. CAL management had received no hazard reports from CAL personnel regarding aircraft being marshalled off the yellow taxi line.
6. CAL management stated that the company had not received a copy of Cheddi Jagan International Airport Airside Directives, dated March 2009. Thus, they were not aware of paragraph 10.4 in this document, which stated "Large Aircraft should not taxi behind a parked B767."

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7. CAL had an approved Fatigue Management System, and the flight crew's flight, duty and rest hours were within the required limits.
8. The contract between CAL and NTHS included the provision of marshalling services.

1.20 Air Navigation Services (ANS).

ANS provided the investigation with the following information:

1. ATC was not informed by the ADO or any other body of the Parking Position to which an incoming aircraft had been assigned.
2. The controller reported that, on the day of the accident, when BW 527, the B737, arrived he instructed the aircraft to exit on taxiway Alpha because he observed that the stairs were positioned on Parking Position 2. As in this case, controllers would often, by experience, guess to which Parking Position an aircraft was probably assigned, and direct them to exit via Alpha or Bravo, accordingly.
3. The controller reported that he was not aware of a Ramp Procedures Manual or any other such document, and there was no copy of any such document in the control tower.
4. The only restriction of which the controller was aware was that if a B767 was parked in Parking Position 1, then aircraft were not allowed to taxi via Alpha. He was not aware of any restriction on the use of Bravo, so, if a B767 was in Parking Position 4, a large aircraft could use Bravo, and this happened regularly if an aircraft had to get to Parking Position 3 when Parking Positions 1 and 2 were occupied.
5. The controller suggested that there should be better coordination between Tower and Airport.
6. The controller had no jurisdiction over the aircraft once it went from the taxiway to the International Apron.
7. The controller stated that when the aircraft turned onto Bravo instead of Alpha, as instructed, he did not stop the aircraft as it would have then have had to be towed backwards, and, further, there was no restriction on the aircraft entering Bravo, and it could have been parking in Parking Position 4, for all he knew.
8. The Director ANS was not aware of Cheddi Jagan International Airport Airside Directives, dated March 2009, of which paragraph 10.4 stated "Large Aircraft should not taxi behind a parked B767.", and, at the time of writing, had not been informed of new procedures at CJIA.
9. ANS was not invited to the CJIA post-accident meeting on 14th December 2016, nor, at the time of writing, had been provided with a copy of the minutes of this meeting.

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10. On 3rd January 2017, the Director ANS was informed by letter from CJIA management that the Airport Duty Officer shall communicate the parking arrangements to the Air Traffic Controller before the arrival of the aircraft. This letter was not copied to any other stakeholders at CJIA, nor to the investigation.

1.21. Cheddi Jagan International Airport (CJIA).

The following information regarding CJIA was obtained:

1. Subsequent to an inspection of the CJIA on 16th November 2016, the Aerodrome Certificate, which expired on 16th November 2016, was not renewed, but was extended by letter until 15th March 2017, pending amendment to the Aerodrome Manual. The report indicated that the SMS was “not fully operational” (see Para. 1.16).
2. The SMS of CJIA was examined by the investigation, and found to be inadequate, especially in terms of the reporting system.
3. CJIA management was not aware of the practice of marshalling aircraft off the yellow line.
4. The “Cheddi Jagan International Airport AIRSIDE DIRECTIVES”, prepared by the Airport Operations Manager, and published on 22nd March 2009, was an uncontrolled document with no amendment process or approval signature. This was the most recent version of this document, and had no validity dates.
5. The CJIA management reported that this document was distributed to all companies which operated at the CJIA, but was unable to produce any distribution list or proof that the document had been received by the companies.
6. The document was comprised of a comprehensive description of procedures to be followed by operators at CJIA.
7. CAL and Fly Jamaica could find no record of having received this document.
8. There was evidence that NTHS had in their possession a soft copy of this document.
9. Paragraph 10.4 of this document included, under Taxiing Restrictions, the statement “*Large Aircraft should not taxi behind a parked B767*”.
10. The managements of CAL, NTHS and ANS stated that they were not aware of this restriction, and this restriction was not included in any instructions to their employees.
11. CJIA informed the Director, ANS, by letter, dated 03/01/2017, that the ADO will tell ATC of parking arrangements for incoming aircraft. No other members of the SMS Committee were copied with this letter, nor was the GCAA or the investigation.
12. Copies of Agreements/Contracts between CJIAC and NTHS, CAL and Fly Jamaica were requested from CJIAC, but were not received.

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13. Copies of the minutes of the last four meetings of the CJIA Operations Committee were requested from CJIA, but were not received.
14. Copies of Hazard Reports received by the CJIA Operations Committee were requested from CJIA, but were not received.
15. A copy of the Corrective Action Plan of CJIA subsequent to the subject accident was requested from CJIA but was not received.
16. CJIA did not send the GCAA or the investigation a copy of the minutes from the CJIA post-accident meeting on 14th December 2016, until after it was specifically requested.
17. The list of operators and aircraft types operating at CJIA, as supplied to the investigation by CJIA, included many B767-200 and B767-300 aircraft (B762 and B763).
18. The distance on Parking Position 3 from the nose wheel mark to the yellow taxi line passing behind the position was reported as being 225 feet.
19. There was no nose wheel mark on the taxi line of Parking Position 4.

1.22 Fly Jamaica Airways Limited.

The Fly Jamaica B767 aircraft was parked at Parking Position 3 with the nose wheel 3 feet short of the marked nose wheel position on the taxi line, meaning its tail was protruding 3 feet back, towards the taxiway. (see Section 6, Photograph #7).

The Fly Jamaica aircraft was a B767-319ER, which, at 180 feet 3 inches, was 21 feet longer than a B767-200 model.

1.22.1. Clearance Requirements.

The ICAO Doc 9157, AN/901, Aerodrome Design manual, Part 2, Chapter 3 “Aprons”, Paragraph 3.4.4 states, in part:

“Location of aircraft stand taxi lanes and apron taxiways should provide the following minimum separation distance between the center line of these taxiways and an aircraft at the stand:

Code letter D – Minimum separation distance from apron taxiway center line to object (is) 40.5 meters (132.874 feet).

The horizontal distance from the tip of the nose cone to the end of the tail cone of the Fly Jamaica 767-319ER was 176 feet 1 inch.

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The horizontal distance from the center of the B767-319ER nose wheel to the aft most point on the aircraft was 165 feet 4 inches.

The wingspan of the B737-800 of the CAL aircraft was 112 feet 7 inches.

Code letter "D" aircraft had a wingspan of 118.11 feet to 170.6 feet.

The Fly Jamaica B767-319ER, with a wingspan of 156 feet 1 inch was a Code letter "D" aircraft.

The combined half wingspan of the B737 (56 feet 3.5 inches) and the distance from the B767 nose wheel to the end of the tail cone (161 feet 2 inches) was 217 feet 5.5 inches.

The B767 was parked with the nose wheel approximately 3 feet short of the "X".

Distance from "X" nose wheel parking point to end of B767 tail cone was 161 feet 2 inches, plus 3 feet, equals 164 feet 2 inches. This, plus half wingspan of B737, 56 feet 3.5 inches, equals 220 feet 5.5 inches.

Distance required from apron taxiway center line to tail of B767 was 132.874 feet, therefore distance required from apron taxiway center line to nose wheel parking point "X" was 132.874 feet plus 165 feet 4 inches, equals 297 feet 10 inches.

Actual distance from apron taxiway center line to tail of B767, when B767 nose wheel was on the "X", was about 55 feet. Therefore, when B767 nose wheel was 3 feet short of the "X" the winglet of the B737 protruded about 4 feet into the tail of the B767.

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2. ANALYSIS

2.1. Most Probable Sequence of Events.

As derived from the Factual Information in this report, the most probable sequence of events immediately preceding the accident was as follows:

- The Airport Duty Officer advised the NTHS supervisor that the B737 was allocated to Parking Position 2.
- The NTHS supervisor advised the NTHS marshallers assigned to this flight that it was assigned to Parking Position 2.
- ATC was not advised about which Parking Position the B737 was assigned.
- ATC guessed that the B737 would be assigned to Parking Position 2, and subsequently cleared the aircraft to taxi via Charlie and Alpha.
- The NTHS marshallers did not know if the aircraft was going to depart taxiway Charlie via taxiway Alpha or Bravo.
- The B737 landed on Runway 06, and turned left onto taxiway Charlie.
- The B737 was cleared by ATC to taxi via Charlie and Alpha to the International Apron.
- The First Officer read back the taxi instructions correctly as Charlie and Alpha to the International Apron.
- While taxiing on Charlie, the Captain asked the First Officer to confirm the taxi instructions, and the First Officer told the Captain it was taxi by Charlie and Bravo to the Apron.
- Wing walker C, at the tail of the B767, made no attempt to signal the B737 to continue on Charlie to Alpha, or to stop, when the B737 was about to turn right, and did turn right, onto Bravo.
- Wing walker C was unaware of any restriction preventing large aircraft from taxiing behind B767 aircraft parked on the International Apron, and the B737 flight crew were also unaware of this.
- The B737 turned directly left as it entered the International Apron from Bravo, without hesitation.
- As the B737 turned left from Bravo to follow the yellow taxi line behind the B767 in Parking Position 3, wing walker C kicked the safety cone about 6 feet in from its position at the tail of the B767, and stepped backwards several paces towards the B767.
- Wing walker C maintained his position with his back to the B767, and did not monitor the right winglet of the B737 as it approached the tail of the B767.

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- Wing walker B, positioned at the entry end of Parking Position 1 and facing the B737 coming towards him, marshalled the B737 for 11 seconds, and until 1 second after impact, towards him, with his right hand horizontal and left hand beckoning, as if signaling the aircraft to turn left off the yellow taxi line to give more clearance between the B737's right winglet and the tail of the B767.
- Wing walker C gave the "emergency stop" signal to the B737 about at impact.
- Wing walker B gave the "emergency stop" signal to the B737 about one second after the impact.
- The First Officer attempted to look out of right Number 3 Windshield Panel just before impact to check the clearance between the right wing tip of the B737 and the tail of the B767.
- The First officer was unable to see through the right Number 3 Windshield Panel as it was "completely frosted to translucence" (because it was unheated).
- The nose wheel of the B737 was on the apron taxiway center line at the time of impact, and the aircraft was aligned along the taxiway.
- The right winglet of the B737 struck the right elevator, the tail cone and the left elevator of the B767, then the B737 came to a halt.

2.2. Most Significant factors.

The most significant factors in the extended period of time preceding the accident are probably as follows:

- The information provided by the Guyana AIP and the Jeppesen chart for CJIA made no mention of any directive pertaining to "Large Aircraft should not taxi behind a parked B767", and there was no other published information regarding this, such as NOTAMs, apart from the Airside Directives of March 2009. These also both stated that all parking positions may be used for any aircraft size.
- The document "AIRSIDE DIRECTIVES", prepared by the CJIA Airport Operations Manager, and dated March 2009, which included in Paragraph 10.4 the directive "Large Aircraft should not taxi behind a parked B767", was not received by CAL or ANS, and NTHS management was unaware of this directive.
- The "AIRSIDE DIRECTIVES (2009)" document was received by RUBIS, NTHS and Laparkan, but was not received by CAL, Fly Jamaica, Suriname Airways, Fly Always and ANS. The other operators did not respond to requests for this information.

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- The employees of CAL and NTHS were unaware of this directive at the time of the accident.
- The ADO was aware of the AIRSIDE DIRECTIVES, including restriction regarding large aircraft taxiing behind parked B767.
- Apart from Security, none of the activities or functions of NTHS were certified, approved or monitored by the GCAA or any other body. This was required by the GARs 12.2.3(c) - which requires that the aerodromes facilities, services and equipment are in accordance with the standards specified.
- The NTHS marshallers assigned to CAL were given practical marshaller training by NTHS. There was no evidence that this practical training was approved or monitored by GCAA, CAL, CJIA or any other body, apart from annual audits by CAL Quality Assurance personnel.
- As per paragraph 1.9.3.4 above, ICAO and the Guyana Aviation Requirements indicate that the management of an airport has some degree of responsibility for the safe movement of aircraft on the ramp; however, the CJIA Airport Manual obviated this responsibility by stating that aircraft operators are required to arrange for their own marshalling services.
- There were “unofficial procedures” taking place on the International Apron, involving aircraft being directed off the yellow taxi line to provide clearance between the wingtip of the taxiing aircraft and the tail of the parked aircraft.
- The management of CJIA and CAL were unaware of these “unofficial procedures”.
- The management of NTHS was aware of these “unofficial procedures”.
- The investigation confirmed that the ADO did not know if an arriving B767 was a -200 model, or a -300 model, nor that the latter was 21 feet longer than the former, thus creating a much more significant ground collision hazard.
- The ADO did not have a “mental picture” of the aircraft parking on the International Apron from the whiteboard in his office.
- The ADO, the Operator and NTHS did not communicate with ATC. The ADO and the marshallers were aware of the assigned Parking Position, but were not aware of ATC’s taxi instructions for Alpha or Bravo taxiways, therefore, as far as they were concerned, the B737 could exit Charlie via Alpha or Bravo, and they had to be ready for either eventuality.
- It is possible that the wing walkers/marshallers anticipated the B737 turning off Charlie on Alpha, as it was assigned Parking Position 2, and the B767 was in Parking Position 3,

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so they were taken by surprise when the B737 turned on Bravo. However, the wing walkers/marshalls had no reason to think that the turn on Bravo was not a possibility, and they had no reason to try to prevent the B737 taxiing behind the B767.

- CJIA did not take up the responsibility for marshalling in Apron Management, as recommended in ICAO Doc 9137 – AN/898 Part 8, Airport Operational Services, First Edition – 1983, paragraph 2.2.3.3 (c):
- Although the above requirement is not precisely reflected in the GARs, GARs 12.2.3(d) does require that the aerodrome operating procedures make satisfactory provision for the safety of aircraft.

2.3 Wing walker/marshaller Training and Performance.

From the Factual Information in this report, it is clear that wing walker C at the tail of the B767 was the “last chance” to avoid the accident.

- Wing walker C’s performance was inadequate as he did not place himself in such a position that he could monitor the proximity of the B737 winglet to the B767 tail, and thus did not act to prevent the collision.
- Assuming that the safety cone was initially correctly positioned under the extremity of the tail of the B767, wing walker C voluntarily discarded this safeguard when he kicked it in towards the B767.
- There is no obvious explanation for this, apart from inadequate training resulting in a loss of situational awareness on his part.
- Wing walker B could apparently see that there was a risk of the B737 winglet hitting the B767 tail, as, at 10 seconds before impact, he commenced signaling the aircraft to turn left. However, he left it too late, and only gave the “stop” signal as the B737 hit the B767, showing that he lost situational awareness.
- Whereas wing walker C was well positioned to prevent the collision, the perspective of Marshaller B was much less advantageous. However, Marshaller B’s actions show that he believed a collision was possible almost 10 seconds before impact, and he should have stopped the aircraft at that time.
- Wing walker B’s action of signaling the aircraft to turn to its left confirmed the “unofficial procedure” of directing aircraft off the yellow taxi line.
- Therefore, the competence and training of both wing walkers was brought into question.

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- When the training of the marshallers was examined, it was found that the practical “on-the-job” marshalling signaling training by NTHS was not conducted under any approved training program, and was not monitored by the GCAA or CAL, but was conducted by NTHS staff, who had no authority to do so.
- In accordance with ICAO Doc 9137 – AN/898 Part 8, (see paragraph 1.10) the Airport Authority, CJIA, should have provided some oversight of the marshaller training, and a marshaller should be “... *trained, qualified and approved by the **appropriate** authority (bolding added) ...*” which was, presumably, the CJIA, or possibly the GCAA. This did not take place.
- Also, CAL should have approved and monitored the marshaller signal training, but did not do so.
- In accordance with ICAO Doc 9137 (see paragraph 1.9.3.4), CJIA should have been responsible for “*the ... control and organization of the safe ... movement of aircraft around the airport and to and from the aircraft stands.*” However, CJIA considered itself divested of these responsibilities by the statement in the Aerodrome Manual “Aircraft operators are required to arrange for their own marshalling service ...” (see paragraph 1.9.3.4), when in fact the airport still had responsibility to ensure *control and organization of the safe ... movement of aircraft around the airport and to and from the aircraft stands.*”

The reason for the above deficiencies was not determined, beyond it being the result of inadequate management, resulting in a loss of operational control.

It is significant that one of the proposals in the minutes of the CJIA meeting of 14th December 2016 was “... to have apron management be effected by CJIA staff” (see paragraph 1.16.2).

The Minutes of the meeting of the CJIA Operations Committee appeared to be the nearest the CJIA came to creating a Corrective Action Plan. However, this document was not a satisfactory answer to the hazards on the International Apron, and, as described in 1.17, it was not distributed in an appropriate and timely manner to all stakeholders.

2.4. ADO Training and Actions.

The ADO’s training program and training records were requested, but were not forthcoming.

The ADO had inadequate training and information, and lacked situational awareness regarding space available for the aircraft. This resulted in a loss of operational control.

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2.5. Published Parking and Taxiing Restrictions.

There were some issues related to these, as follows (see paragraph 1.9.3.2):

1. The Airside Directives of March 2009, paragraph 10.4, made no mention of the B767 parked in Parking Positions 2 and/or 3; did not differentiate between the B767-200 model and the B767-300 model; which is 21 feet longer, did not define “Large aircraft”; and did not mention the option of aircraft being towed.

The evidence indicated that the distribution of the Airside Directives publication was such that it did not reach down to those to whom it was directed, i.e. flight crew and wing walkers/marshalls; thus, the flight crew of the CAL B737 was not aware of the safeguarding statement “*Large aircraft should not taxi behind a parked B767*”, nor were the wing walkers/marshalls who were guiding the aircraft aware of this.

2. The statement “*Large aircraft should not taxi behind a parked B767*”, showed that CJIA had serious concerns about a ground collision, but dealt with it inadequately.
3. The Guyana AIP and the Jeppesen Parking Restrictions both stated, “All parking positions may be used for aircraft of any size”, which was obviously inadvisable and likely to cause ground collisions. Also, it contradicted the Airside Directive.
4. The Guyana AIP and the Jeppesen Taxiing Restrictions addressed only circumstances existing when Parking Position 1 was occupied.

From this information, a flight crew could conclude:

1. When Parking Position 1 was occupied by a B737, other aircraft should use taxiway Bravo.
2. It was permitted to park an aircraft of **any size** in any of the Parking Positions,
3. It was permitted to tow an aircraft of **any size** behind **any** aircraft parked in Parking Position 1 (AIP).
4. Taxiway Alpha was closed if a B767 was in Parking Position 1 (Jeppesen).
5. It was permitted to taxi an aircraft of **any size** behind an aircraft of **any size** parked in Parking Positions 2 ,3, or 4.

Thus, these three sets of instructions were inadequate to prevent, and were more likely to cause, ground collisions, and, in any event, it was unlikely that any instructions other than the Jeppesen ones would be available to an incoming flight crew.

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Nothing in the AIP and Jeppesen instructions prevented a B767 taxiing behind another B767 parked in Parking Position 3.

The B737 Captain did not violate the Jeppesen instructions which were available to him.

The procedures to be implemented from the CJIA meeting of 14th December 2016 did not solve the problems (see 1.17).

2.6 Personnel Fatigue and Medical Condition.

The accident would also have been avoided if the B737 flight crew had followed their taxi instructions.

Although the flight crew were within the mandated Flight/Duty/Rest times, and had had adequate rest in JKF before the flight, it is possible that fatigue played a part in the flight crew misunderstanding the taxi instructions, as the night flight had turned their diurnal rhythm upside down, a condition known to affect human performance.

The First Officer's back injury was not considered to be a causal factor.

The wing walkers/marshalls started work at 10:30hrs, so were not considered to have been fatigued.

2.7 ATC

The lack of communication between ATC and the operators and the Airport Duty Officer, which left ATC not being informed as to the incoming aircraft's assigned parking position, was found to be a safety hazard in as far as ATC could not give the incoming aircraft complete taxi instructions, and it was left to the controller to guess which Parking Position was assigned, and therefore which taxiway, Alpha or Bravo, the aircraft should use. The wing walkers, likewise, had to be prepared for the aircraft to taxi on Alpha or Bravo.

Also, ATC had not been given the Airside Directives or any kind of ramp manual, and was unaware of the prohibition of large aircraft taxiing behind a parked B767.

Furthermore, ANS was not part of the Airport Operational Committee, and was therefore not in the CJIA stakeholders' communications loop.

These factors show a lack of organization on the part of CJIA, and a subsequent loss of operational control, resulting in the accident.

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2.8. Agreements.

At the time of the accident, the CJIA was unable to produce any valid agreement document between CJIA and NTHS; and CJIA and CAL.

This was not of central relevance to the accident, but lack of this could have serious consequences, and was another aspect of inadequate operational control on the part of CJIA.

2.9. B737 Number 3 Windshield Panels.

Visibility through the unheated Number 3 Windshield Panel on the First Officer's side (right) was obscured by condensation when he tried to glance through it as the B737's right winglet approached the B767 tail.

The investigation could not determine whether or not the First Officer might have been able to tell the Captain to stop the aircraft in time to avoid the collision, had the windshield been clear, but it is certainly a possibility.

Visibility through the Number 3 Windshield Panel on each side of the cockpit is a resource that the design of the aircraft provides to the flight crew, increasing their situational awareness by enabling them to monitor the extremities of the wings. It is apparent that this window can be obscured by moisture, thus constraining the crew's situational awareness, and this might happen, as in these circumstances, when a clear view is most needed. Thus, as the cost for the option of heated Number 3 Windshield Panels is minimal, a recommendation is made that all new B737s should have heated Number 3 Windshield Panels.

2.10 Parking of B767.

The B767 was parked with the nose wheel three feet short of the marked position on the parking line. This meant that the B767's tail was protruding 3 feet further back, and into the path of the B737, than if the aircraft had been correctly parked.

As the flight crew could not see the nose wheel's position from the cockpit, it was the responsibility of the marshaller to ensure the nose wheel was in the correct position. This was not done. This was another example of poor marshalling procedures, and inadequate operational control.

If the B767 had been correctly parked, it is probable that the winglet would still have contacted the tail of the aircraft, and caused damage.

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2.11. Clearance Requirements.

The ICAO Doc 9157, AN/901, Aerodrome Design manual, Part 2, Chapter 3 “Aprons”, Paragraph 3.4.4 states, in part:

“Location of aircraft stand taxi lanes and apron taxiways should provide the following minimum separation distance between the center line of these taxiways and an aircraft at the stand:

Code letter D – Minimum separation distance from apron taxiway center line to object (is) 40.5 meters (132.874 feet).”

As explained in Paragraph 1.23 “Clearance Requirements” above, the International Apron at CJIA did not meet the clearance standards of the stated ICAO Doc.

2.12 Safety Management System (SMS)

The SMS of CJIA was found by both the GCAA auditor in November 2016 and the investigation to be not “fully operational” (see Paragraph 1.16, Safety Management System).

The following issues in the CJIA SMS were noted by the investigation:

- SMS Manual not complete and in two separate parts.
- No reporting form in SMS manual.
- No Confidential Reporting System.
- No evidence of any hazard reports having been made.
- No evidence of Airport Operations Committee safety meetings.
- CJIA’s reluctance or inability to produce minutes of meetings.
- Inadequate distribution of Airside Directives.
- Inadequate distribution of minutes of 14th December 2016 meeting (corrective action plan?).
- Incomplete inclusion of stakeholders in meetings.
- No effective corrective action plan following CAL/Fly Jamaica collision accident.
- General lack of organization, and lack of commitment to an SMS.
- No oversight of NTHS.

Similarly, for CAL, the employees were reportedly aware of these hazardous, unofficial procedures, but no hazard reports were made, indicating an SMS that was not functioning correctly.

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NTHS management seemed unaware of the necessity for an SMS.

The GCAA had noted the deficiencies in the CJIA's SMS, but had not made much progress in having CJIA rectify this.

The CJIA was reluctant to share some information requested by the investigation. This was due to a disagreement between GCAA and CJIA regarding the right of GCAA to investigate occurrences at CJIA.

2.13 CJIA: Operational Control.

The investigation considered that the non-functional state of CJIA's SMS was closely related to the apparent lack of Operational Control, and the cause of the accident.

The disorganized state of communications observed at CJIA, including lack of evidence delivered to the investigation; lack of agreement with NTHS; lack of control of the International Apron; lack of corrective action plan; lack of proper organization of Airport Operations Committee members' meetings and minutes; and poor management of preparation and distribution of Airside Directives, all indicated a lack of operational control.

These conditions resulted in New Timehri Handling Services operating on the International Apron with no official oversight in terms of approval, certification, inspection, monitoring and without an operating agreement with CJIA, and with no approved SMS.

The final result of these circumstances was that wing walkers/marshalls were conducting "unofficial procedures" on the ramp, breaking directives, directing aircraft off the yellow taxi lines, not directing aircraft properly with due care and attention, and all this resulted in the accident.

If there had been a properly established SMS, with an adequate reporting system, the irregularities on the International Apron would have been reported to management and rectified, and the accident would probably have been avoided.

2.14 Other Factors

The investigation determined that weather, communications and airworthiness were not causal factors in this accident.

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2.15 Other considerations

In fairness to the B737 Captain:

1. The Captain was not aware of para. 10.4 of the Airside Directive stopping large aircraft from taxiing behind B767 aircraft parked on the International Apron.
2. The B737 aircraft was on the apron taxiway center line at impact.
3. The Captain did not expect, and did not notice, wing walker B directing him to the left.
4. The Jeppesen chart did not forbid taxiing a B737 behind a parked B767.

In fairness to the wing walkers:

1. They were not aware of para. 10.4 of Airside Directive stopping large aircraft from taxiing behind B767 parked on the International Apron.
2. They did not know if the B737 aircraft would turn on Alpha or Bravo.
3. They were familiar with the “Irregular Practice” of directing the aircraft to the left, off the apron taxiway center line and probably did not realise that this was an improper procedure. This practice was condoned by their company.

2.16 Safety Culture

The evidence from the investigation indicated that the Safety Culture at CJIA was well below an acceptable standard.

It is obvious that some time before the accident, the management of CJIA had realized that the presence of the B767 on the International Apron created a risk of ground collision, and had published the Airside Directives, including the statement in paragraph 10.4, “Large Aircraft should not taxi behind a parked B767”.

However, this was inadequate, as:

1. “Large Aircraft” was not defined.
2. The information was not included in the AIP taxi chart for CJIA, nor the Jeppesen chart, nor was it notified by NOTAM or any other means.
3. The document was not controlled, and bore no authorizing signature.
4. The document was not distributed in such a fashion that information was assured to reach the relevant individuals in the stakeholder companies.

The following observations were made regarding the Safety Culture of CJIA:

- Poor communication was observed in many aspects of CJIA’s operation.

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- The SMS Committee was not functioning as required, in as far as minutes were not distributed in a timely fashion, ANS was not on the committee and there was no evidence of any minutes of previous meetings, although these were requested.
- CJIA management did not distribute revised procedures to all involved parties immediately.

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3.0 FINDINGS

3.1 Findings: Causal.

1. The NTHS ramp personnel were not aware of the Airside Directive forbidding the taxiing of large aircraft behind parked B767s on the International Apron.
2. The CAL flight crew was not aware of the Airside Directive forbidding the taxiing of large aircraft behind parked B767s on the International Apron.
3. The Airside Directive forbidding the taxiing of large aircraft behind parked B767s on the International Apron was inadequately distributed.
4. After preparation of its AIRSIDE DIRECTIVE, the CJIA did not follow through with its responsibility to ensure that relevant information was transmitted to the GCAA and Jeppesen for inclusion in the AIP and the Jeppesen Charts respectively.
5. The Jeppesen and AIP airport charts for CJIA did not forbid the taxiing of large aircraft behind parked B767s on the International Apron.
6. The B737 First Officer erred when he misdirected the Captain to turn on taxiway Bravo, rather than taxiway Alpha.
7. Wing walker C intentionally moved the safety cone placed to mark the position of the B767's tail.
8. Wing walker C did not adequately monitor the track of the B737's right winglet to ensure clearance from the B767's tail.
9. Wing walker B did not adequately monitor the track of the B737's right winglet to ensure clearance from the B767's tail.
10. Wing walker B attempted to marshal the B737 aircraft off to the left of the yellow taxi line to avoid the B737's right winglet hitting the tail of the B767.
11. Wing walker B did not give a "Stop" signal to the B737 in time.
12. Wing walker C did not give a "Stop" signal to the B737 in time.
13. The right hand Number 3 Windshield Panel of the B737 was not heated, and was obscured by moisture, preventing the First Officer from adequately monitoring the clearance of the right winglet from the tail of the B767.
14. The right winglet of the B737 struck the elevators and tail cone of the B767.
15. Wing walker C had not been adequately trained.
16. The practical marshaller training by NTHS was not approved or monitored by CAL, CJIA or GCAA.
17. Wing walkers/marshalls on the CJIA ramp were following an unapproved procedure of directing aircraft off the yellow line to avoid other aircraft.

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18. CAL and CJIA management were not aware of this unapproved procedure.
19. NTHS was aware of, and condoned, this unapproved procedure.
20. B737 pilots were routinely taxiing off the yellow line.
21. No hazard reports regarding this unapproved procedure were made to NTHS, CJIA or GCAA.
22. The dimensions of the layout of the CJIA International Apron did not meet the ICAO Recommended Standards for the aircraft it handled.
23. The SMSs of CJIA and CAL were inadequate.
24. NTHS had an SMS program, but it was not approved, nor was it required to be approved.
25. NTHS was not certified, approved or monitored by any other organization or authority, nor was this required.
26. Neither GCAA nor CJIA provided oversight of CJIA ramp operations.
27. The GCAA approved the Aerodrome Manual which was deficient. This was especially so in the SMS
28. GCAA inspection of records, during aerodrome inspections, was deficient as there was no demand for presentation of agreements/records between the CJIA and its clients operating at the airport.
29. GCAA did not adequately assess the inherently unsafe situation existing in the dimension and layout of the international apron.

3.2. Findings: Other

1. There was no agreement in place between CJIA and NTHS, nor between CJIA and CAL.

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4. SAFETY RECOMMENDATIONS.

1. CJIA Airside Directives should be transmitted to all stakeholders at CJIA, in a timely manner, and there should be records of their delivery and receipt.
2. The term “large aircraft” in the CJIA Directives should be defined by aircraft category, gross weight or dimensions.
3. Apron Procedures should include the Airside Directives, and be published in the Taxi and Parking Restrictions in the Guyana AIP and the Jeppesen Charts for CJIA.
4. The ADO should be provided with information regarding the size of the incoming aircraft.
5. The ADO’s office should be equipped with a whiteboard showing the parking positions on the International Apron.
6. The ADO should be aware of the Taxi and Parking Restrictions published in the Guyana AIP and the Jeppesen charts.
7. The ADO should inform ATC of the parking position allocation of incoming aircraft.
8. Taxi and Parking Restrictions should be reconsidered to avoid potential conflict of aircraft.
9. In accordance with ICAO Doc 9137 – AN/898 Part 8, Airport Operational Services, First Edition – 1983, Paragraph 2.2.3.1, the CJIA Airport Operations Section should be responsible for the day-to-day control and organization of the safe and expeditious movement of aircraft around the airport and to and from the aircraft stands.
10. There should be valid written agreements between CJIA and air operators and handling companies.
11. New Timehri Handling Services should be certified and monitored by the GCAA.
12. “Unofficial procedures” at CJIA should be immediately halted.
13. Boeing 737-800 series aircraft Number 3 Windshield Panels should be heated.
14. The SMS of CJIA should be upgraded to a fully functioning level.
15. All stakeholders, including ANS and GCAA, should be included in the CJIA Safety Committee.
16. The GCAA should give guidance and insist that the dimensions and layout of the international apron, comply with the required standards; or request from CJIA proof that the safety standard would be maintained by alternative safety measures.

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5. ACTIONS TAKEN SINCE THIS OCCURRENCE

TTCAA has recommended:

1. Amendments to sub-section 8.13.4.4 (Taxi Procedures) of the CAL Operations Manual Part 'A'. (Ref. TTCAA Approval of Rev. 52 dated January 10, 2017).
2. Prior to resumption of flying duties, an approved remedial training programme for the B737 Flight Crew to include Proficiency Test and Line Checks.

Both of these recommendations have been accepted and implemented by CAL.

6. FIGURES

Figure 1. CJIA Airside Directives.

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CHEDDI JAGAN INTERNATIONAL AIRPORT
TIMEHRI

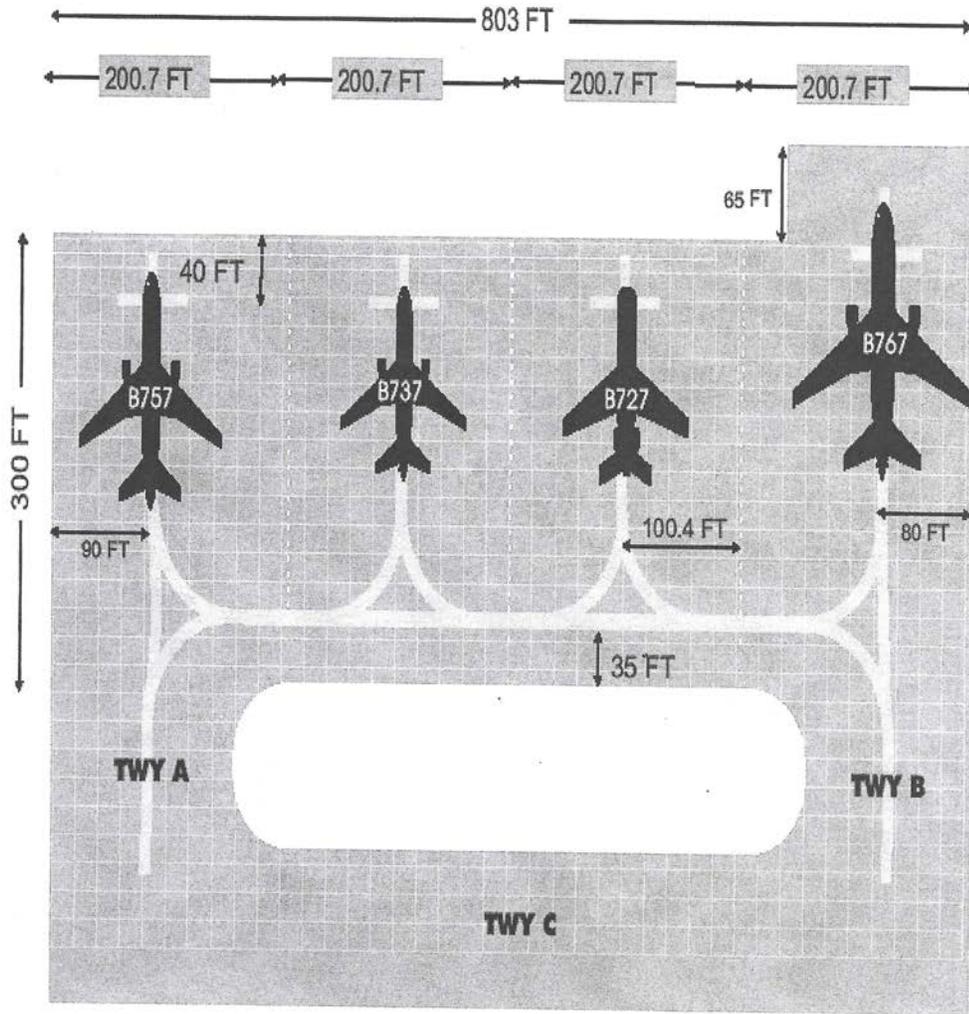
AIRSIDE DIRECTIVES

CHEDDI JAGAN INTERNATIONAL AIRPORT CORPORATION
AIRPORT OPERATIONS MANAGER
MARCH 2009

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AIRSIDE DIRECTIVES
CHEDDI JAGAN INTERNATIONAL AIRPORT

13.0 INTERNATIONAL APRON LAYOUT



CHEDDI JAGAN INTERNATIONAL AIRPORT PROPOSED PARKING CHART

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AIRSIDE DIRECTIVES
CHEDDI JAGAN INTERNATIONAL AIRPORT

10.4 PARKING OF AIRCRAFT ON THE INTERNATIONAL APRON

Aircraft shall be parked in a nose-in parking system on the International Apron at CJIA, in accordance with the following procedures:

There are four (4) nose-in parking positions numbered 1, 2, 3, and 4, starting from the southern extremity of the apron. Signs identifying the Parking Position Number are located on the western edge of the Apron.

Taxiing Restrictions

When the B767 is parked on Position 1, other aircraft wishing to park in Positions 2, 3, or 4 shall access the apron via taxiway BRAVO.

Alternatively, when the B767 is parked on Position 4, other aircraft wishing to park in Positions 1, 2 or 3 shall access the apron via taxiway ALPHA.

Large Aircraft should not taxi behind a parked B767.

Departure Procedures

Jet aircraft will be pushed back from parking positions to locations on the apron where they can safely taxi out on their own power.

Propeller aircraft of type up to the size of the Dash 8 may start engines and taxi out on their own power, provided that there is adequate clearance between other aircraft, buildings and obstructions.

Allocation of Parking Positions

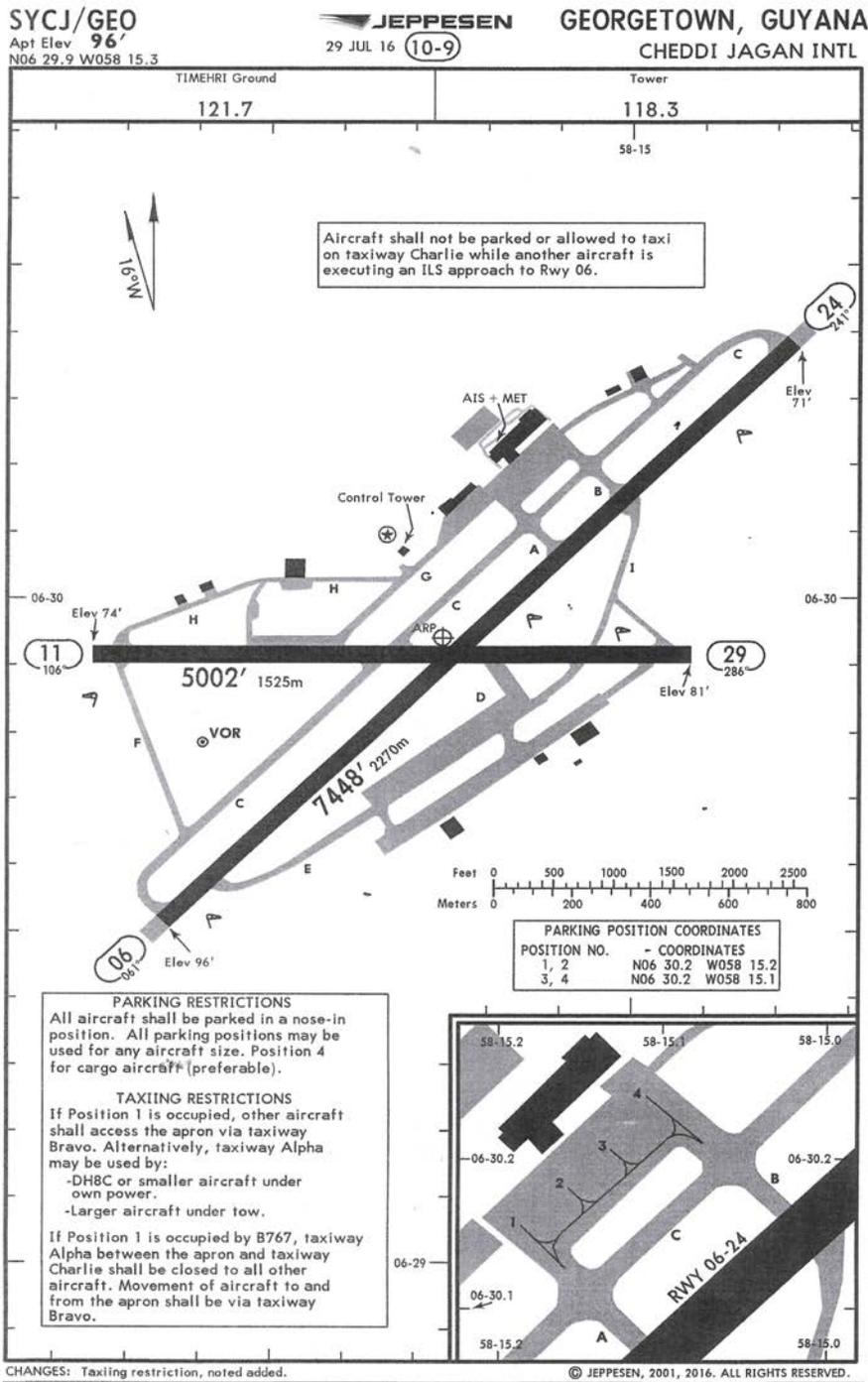
Parking Positions shall be allocated by the Airport Duty Officer.

Prior to the arrival of the Aircraft, Operators shall coordinate with the Airport Duty Officer who will allocate the Parking Positions to be used.

Such coordination must be effected at least one hour prior to the estimated arrival of the Aircraft.

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Figure 3. Jeppesen chart, P. 10-9, Georgetown, Guyana.



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7. PHOTOGRAPHS



1. Front view of CAL aircraft.

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2. Winglet of CAL aircraft.

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3. Damaged parts of B767 on ground.

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4. Damage to B767 left elevator.

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5. Damage to B767 tail cone.

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6. Damage to B767 right elevator.

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7. Position of B767 nose wheel.

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8. Position of B767 main gear.

END