

Accident Report

25th December 2013

Hewanorra International Airport, St Lucia (TLPL)

Airbus A330-343

Registration G-VNVC

Operated by Virgin Atlantic Airways

FOREWORD

In accordance with Annex 13 to the Convention on International Civil Aviation this investigation is intended neither to apportion blame, nor to assess individual or collective liability. Its sole objective is to draw lessons from the occurrence which may help prevent future accidents.

Consequently, the use of this report for any purpose other than for the prevention of future accidents could lead to erroneous interpretations.

SYNOPSIS

Aircraft Type and Registration:	Airbus A330-343 / G-VNYC
No & Type of Engines:	2 Rolls Royce Trent 772B-60
Year of A/C Manufacture:	2012
Location:	(Hewanorra International Airport, St Lucia (TLPL)
Date & Time (UTC):	25 th December 2013 at 00:15
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Pilots: 2 Cabin Crew: 12 Passengers: 18
Injuries:	None
Nature of Damage:	Substantial damage to under Fuselage
Commanders Licence:	Airline Transport Pilot's Licence
Commanders Age:	50 Years
Commanders Flying Experience:	13,000 hours (of which 9,800 hours on A330/340 Last 90 days 159 hours Last 28 days 53 hours
Information Source:	ECCAA Accident Investigation

All times in this report are UTC; St Lucia time is UTC – 4 hrs

The Investigation

The Eastern Caribbean Civil Aviation Authority (ECCA) was informed of the accident by the operator; Virgin Atlantic Airways who reported it to the Director General of the ECCAA on the morning of 27th December 2013. A delegation of senior staff from the ECCAA attended the scene of the accident the following morning.

The ECCAA began an investigation under the St Lucia Civil Aviation Regulations 2007. In accordance with established international arrangements, the Air Accidents Investigation Branch (AAIB) representing the State of Registry was informed and provided assistance in the reading of the CVR and FDR. Virgin Atlantic Airways Limited, the operator, is also cooperating with the investigation.

Initial investigative activity focused on examination of the aircraft, gathering of evidence from witnesses and examination of technical records. Further investigation will encompass all operational and engineering matters in addition to obtaining remaining reports and recordings.

FACTUAL INFORMATION

History of the Flight

On December 24th 2013 an Airbus A 330-343 aircraft registered G-VNYC was scheduled to operate Flight VS97 from Hewanorra International Airport, St Lucia (TLPL) to the Robinson International Airport, Tobago (TTCP) The aircraft and crew were then scheduled to operate Flight VS98 from Robinson International Airport, Tobago (TTCP) to Hewanorra International Airport, St Lucia (TLPL). Following this Flight, the aircraft was scheduled to operate Flight VS98 from Hewanorra to London Gatwick Airport.

Flight VS97 departed Hewanorra International Airport, St Lucia (TLPL) and arrived in Robinson International Airport, Tobago (TTCP) without incident. The departure of the returning Flight VS98 to UVF was delayed in Tobago (TTCP) due to thunderstorm activity, heavy rainfall, lightning and wind gusts of between thirty and forty knots that resulted in intermittent closures of the Hewanorra Airport, St Lucia (TLPA).

After becoming airborne, Piarco Air Traffic Control cleared Flight VS98 direct to the BNE VOR (TLPL) at FL210 (The co-pilot was the pilot flying at this time). The aircraft first contacted Hewanorra Air Traffic Control Tower, St Lucia (TLPL) at 23:08 and reported 128 miles southwest of the airport. The tower controller advised the captain of the weather, as follows: (*Wind variable between 180 and 300 degrees at 09 Knots, 5000 meters visibility with thunder storm activity at the field...clouds few at 600 feet, scattered at 1100 feet, Thunderstorms in all quadrants, temperature 25, dew point 24, QNH 1012*).

At 23:24, the captain asked the tower controller to confirm that the airport was still open, the controller replied that the airport was closed due to weather and proceeded to give the weather conditions. This weather report included winds of between 20 and 40 Knots varying between 210 and 360 degrees. The visibility at the airport had decreased to 2000 meters and lightning was reported. The captain advised that he was now 18 miles South West of the airport and would like to enter the hold at position TUBED.

At 23:26, the controller advised that the Metrological Office reported that their will be no expected change in the weather for the next hour.

At 23:48, the captain requested from the controller if there was any change in the weather. He was advised that there was not and was further asked to confirm that he was holding at position TUBED. The captain advised that they were not at TUBED but were 10 miles South West of TUBED due to weather.

At 23:55, the controller advised that there was some improvement in the visibility at the airport and asked the crew of Flight VS98 to standby for the official Met report. The 00:00 weather was given at 00:03 as follows: (*Wind 020 degrees at 25 knots, visibility 3000 meters with thundershowers, clouds few at 600 feet, broken at 1200 feet CB's in all quadrants, broken at 1400 feet, temperature 24, dew point 22 and QNH 1013*).

After some discussion regarding the visibility required for landing, at 00:05 on the 25th December 2013, the tower controller confirmed that the field was now open and the aircraft was cleared for the RNAV approach to Runway 10 at Hewanorra (TLPN)

The captain was the pilot flying during the approach and landing.

At 00:04:55, St Lucia approach advised the crew to contact Martinique approach to coordinate the approach clearance as they (St Lucia) had no contact with them (Martinique). This was done and Martinique cleared the aircraft to 3000 feet and advised them to contact Hewanorra (TLPN). Following confirmation of the clearance from Hewanorra approach, there was some discussion between the crew about the weather and the go around procedure to be used in the event of a missed approach. The fact that the wind was outside the cross wind limits of the aircraft was also mentioned. (Note, this was not a factor during the final stages of the approach).

At 00:08, Flight VS98 reported at position TUBED commencing the approach. Shortly before passing position MATES, the co-pilot confirmed that the aircraft was fully configured for landing. He reported at the final fix at 1800 feet and confirms an altitude check.

At 00:12:59, Flight VS98 reported position MATES. The controller confirmed this and said that he does not have the aircraft in sight yet; however, at 00:13:40 he confirmed having the aircraft in sight and cleared it to land giving the wind as 010 degrees at 10 knots, (The aircraft was at an altitude of 1000 feet at this time). Fifteen (15) seconds later, the crew reported the field in sight and confirmed the landing clearance.

The aircraft landed at 00:15:10. The crew reported that a "juddering" was felt and the aircraft deceleration was more significant than expected, (Auto brakes were set to MED). It was also reported that the aircraft veered towards the left but was able to be brought under control. Shortly after this, the crew reported a number of ECAM cautions were displayed; they included air left wing leak.

The aircraft taxied onto the ramp via taxiway "C" and parked on Stand 4 (both the taxiway and the stand were free from standing water at this time.) The captain was then summoned by the ground engineer to come outside and look at the aircraft as the Pack Bay area had been damaged. The crew reported seeing no obstacles during the landing. However, on inspection, it was observed that the Pack Bay area on the underside of the aircraft had been extensively damaged.

After reviewing the damage, the captain suspected that the aircraft may have struck a solid object on the runway.

Injuries to persons

	<u>Fatal</u>	<u>Serious</u>	<u>Minor / None</u>
Crew	Nil	-	Nil
Passengers	Nil	-	Nil
Third parties	Nil	-	Nil

Damage to aircraft

From the initial inspection, it was evident that the damage was predominately to the belly panels from frames 37 to 40, 6 panels having significant damage and there was extensive damage to the belly panel supporting structure. Due to the panels being pushed upwards, significant damage had occurred to the cross bleed system ducting, pack ducting and potentially the packs themselves. There was also some damage to several brake units, 2 minor scratches to the fuselage, and a dent to right hand #2 Flap fairing. There was also some damage noted to the undercarriage.

The nature of the damage to the belly panels in the vicinity of the Pack Bay area indicates that the aircraft had come into contact with a significant amount of water at high speed. There was no evidence that the aircraft was struck by any other object.



Fig. 1

Other damage

Several sections of the airport security perimeter fence were damaged during the flooding

In viewing the condition of the perimeter fencing, there is evidence to suggest that the rate of flowing water was significant, as the concrete footings for the posts were seen to be ripped out of the ground. The debris caught within the fencing was approximately 3 foot high.



Fig. 2

Personnel information

Captain's Licence: Airline Transport Pilot's Licence

Captain's Age: 50 years

Captain's Flying Experience: 13,000 hours (of which 9,800 hours on A330/A340 type)

Hours last 90 days - 159 hours

Hours last 28 days - 53 hours

FO's Licence: Airline Transport Pilot's Licence

FO's Age: 30 years

FO's Flying Experience: 4,783 hours (of which 807 hours on A330)

Hours last 90 days: 150 hours

Hours last 28 days: 43 hours

Aircraft information

Aircraft type: Airbus A330-343

Engine Model: TRENT 772B-60

Year of Manufacture: 2012

Meteorological Information

Weather conditions at 20:26

SPECI TLPL 242026Z 10018KT 3000 -TSRA FEW007 SCT010CB BKN015 26/24 Q1010=

Visibility: 3000m, wind 18kt from 100°, scattered cumulonimbus at 1000ft, shower rain.

Weather conditions on initial contact with Hewanorra International Airport, St Lucia (TLPL) at 23:08 were given as follows:

Wind variable between 180 and 300 degrees at 09 Knots, Visibility 5000 meters, thunder showers at the field, clouds few at 600 feet, scattered at 1100 feet, CB's in all quadrants, temperature 25, dew point 24 QNH 1012

Weather conditions prior to landing at Hewanorra International Airport, St Lucia (TLPL) at 00:08 were given as follows:

Wind 020 degrees at 25 Knots, Visibility 3000 meters, thunder showers at the field, clouds few at 600 feet, broken at 1200 feet, CB's in all quadrants, broken at 1400 feet, temperature 24, dew point 22, QNH 1013

Airport Information

The Hewanorra International Airport is located on the South Coast of the island; Runway 10 / 28 has an asphalt surface with a landing distance available of 8888 feet (2709 Meters)

Runway Information

Hewanorra Airport - Runway 10

Runway Magnetic Heading 104°

Runway length 9,003 ft (2744 m)

Runway elevation 14ft

Runway width 150 ft (46 m)



Fig.3

Flight Recorders

The Flight Data Recorder report obtained from Airbus shows an uneventful stabilized approach to Runway 10 at Hewanorra (TLP/C) with the captain being the pilot flying. The Autopilot was disconnected at 680 feet. All approach indications appeared normal and showed an approach which met all stable approach criteria. The Flight Data Recorder indicates the aircraft touching down 700 meters (2300 feet) from the runway threshold and to the right of the centerline at a speed of 135kt CAS. The Flight data recorder indicates full reverse thrust was applied through approximately 100 knots. The left hand spoilers are shown to fluctuate (right hand side remain fully extended), this coincides with full rudder deflection being applied. The nose wheel touched down at approximately 120kt, followed by a left turn of 3° onto 099° followed by a right turn of 8° onto 107° at a speed of 75kt. A right turn of 6° appeared to correct the aircraft back onto the runway heading at a speed of 40kt. These changes in direction may be due to aquaplaning, a theory supported by witnesses and the fact that this occurred adjacent to the original path of the river (the likely point of initial flooding). By calculation, the maximum deviation is approximately 6-7 meters from the left hand edge of the runway surface before corrections from the crew restored it towards the centerline. The maximum lateral acceleration recorded in the Flight Recorder was -0.19G, 3 seconds after touchdown. The maximum longitudinal acceleration was -0.65G, 1 second prior to this. Following the landing there are no further abnormal variations in vertical acceleration, which may have suggested a deviation from the paved surface. The screenshot in Fig. 5 gives a pictorial representation of the landing and rollout.

The Flight Data Recorder analysis obtained from the manufacturer is shown below:

Approach and landing

AP2 was disengaged at 680 ft RA (00:14:02 UTC). Captain was pilot flying.

Both FD1 & FD2 were engaged (in VS/HDG modes).

At 00:14:10 UTC, both FD were disengaged.

ATHR was active in SPEED mode. Speed target was managed.
Speed target = 136kt, estimated VLS=126kts.

Manual Visual final approach (no ILS available on that airport).

Flare was initiated at 39ft RA (00:14:50 UTC) as a -9.8° nose up input was applied on Captain side.

At 15ft RA (00:14:53 UTC), throttle levers were retarded.

Touchdown on both MLG (00:14:59 UTC) with:- Max recorded VRTG = 1.20G (delta of 0.18G),
 $+3.5^\circ$ pitch angle,

-2.5° left roll angle,

$+4.2^\circ$ crab angle (HDG < TRK),

Max recorded LATG = $+0.09G$ (consistent with crab angle),

Vertical speed at touchdown was estimated at -2.0ft/s (Method used: RALT derivative)

According to computed trajectory (cf §3), A/C touched down at approximately 700m from runway threshold.

At 00:15:00 UTC, ground spoilers deployed.

At 00:15:01 UTC, full reverse thrust was applied.

At 00:15:02 UTC, GS=136kt, NLG was recorded compressed, then longitudinal deceleration suddenly increased during 3s with a peak at 0.67G (00:15:04) then decreased down to 0.28G. Auto brake was active, braking pressure progressively increased up to 1344 PSI. All wheel speeds except wheel speed 3 and wheel speed 7 were recorded below reference speed until 00:15:10, which is consistent with nominal antiskid activity.

At 00:15:05 UTC, GS=106kt, right rudder pedal was applied up to -31.5° (max rudder pedal deflection) to counter a left departure (LATG increased up to $+0.2G$), then heading increased from 99° up to 108° (QFU=104°).

At 00:15:08 UTC, Flow control valve 1 disagree (FLOW1F) and then Flow control valve 2 disagree (FLOW2F) were recorded triggering. 10s later, ENG2 bleed fault and ENG1 bleed fault were recorded triggering. At the same time master caution triggered for approximately 2s.

Note : the crew reported a “AIR L WING LEAK” on ECAM display, according to FCOM DSC-36-40, this failure is associated with the local warning “Eng bleed fault” and the master caution alert.

At 00:15:19 UTC, GS=31kt, auto brake was disengaged as symmetric manual braking was applied up to 25° .

A/C was aligned on runway (QFU=104°).

Trajectory

The trajectory was computed with the “Ground speed track” method. A/C position is computed by integration of the ground speed along the A/C track.

It confirmed the deviation left to the runway without lateral excursion. The aircraft was brought back towards the centreline with rudder.

Conclusion

Flight data recordings indicated adherence to standard operating procedures and nominal response of the airframe and power plant.

ANALYSIS

The nature of the damage points to the aircraft coming into contact with a significant amount of water at high speed. There is no evidence that the aircraft was struck by any other object.

CONCLUSIONS

The investigation revealed that the original course of the river to the north of the runway had been diverted to allow for runway construction. The evidence indicates that as a result of the extreme weather and heavy rain that existed at the airport that night, the river burst its banks at the point where the original course of the river had been diverted 90 degrees to the west. This resulted in the touchdown area of the runway being flooded.

The controller on duty at the time of the accident was interviewed by the ECCAA investigation team; his memory of events matched the captain's report. The key points being that the weather at the time of landing included rain and gusting winds; clearance to land was given and visibility was better than the required minimum. The controller stated that he was not aware that there was standing water on the runway (the airport was very dark and from the tower, it was not possible see any flooding or debris on the touchdown area of the runway).

The Air Traffic Controller reported that he saw the splash of water when the aircraft touched down. This has been further supported by a ground handling agent who witnessed the landing. The Manager of Air Traffic Control confirmed that the runway is routinely inspected twice a day and that it was last inspected at 21.30 on the 24th December (Flight VS98 landed at 00.15 on the 25th December 2013).

After the aircraft had been positioned on stand # 4, prior to the disembarkation of the passengers, the river began flooding the airport terminal, the ramp and runway area. This second deluge is believed to have deposited debris such as logs / branches, Unit Load Devices (ULD) and other baggage loading equipment that was observed on the runway and surrounding areas later that evening.

There is no evidence that the aircraft struck any objects. The data shows that the aircraft came within 6 metres of the left hand edge of the runway

After considering all the evidence, including witness statements and the damage to the aircraft, The Authority's conclusion is that the aircraft landed in approximately one (1) to two (2) feet of water on the touchdown zone of Runway 10. This caused significant damage to the underside of the aircraft, as outlined on page 7 of this report.



Fig. 4

The river burst its banks at the point where it makes a 90 degree turn to the west prior to paralleling the runway, thereby flooding the touchdown area of the runway.



Fig. 5

Track of the aircraft after touchdown.

SAFETY RECOMENDATIONS

1. The St Lucia Authorities should implement more frequent runway inspections at the Hewanorra International Airport during periods of severe weather conditions in order to check for flooding.
2. The St Lucia Authorities should install physical 'high level' indicators to warn of rising water levels in the adjacent river to the North of the Hewanorra International Airport.
3. The St Lucia Authorities should install flood defences in order to prevent future runway contamination at the Hewanorra International Airport should the river burst its banks.
4. The St Lucia Authorities should install Unit Load Device (ULD) and ground equipment storage areas at the Hewanorra International Airport that would avoid these items being carried by flood waters or high winds onto the runway in adverse weather conditions.
5. The St Lucia Authorities should ensure that clearance to land is not given by Air Traffic Control unless the controller can be reasonably assured that the Runway is free from significant standing water during periods of heavy rain.
6. Given the potentially serious outcome of this incident, the Eastern Caribbean Civil Aviation Authority (ECCA) should share the investigation results and recommendations with industry safety forums and other Caribbean operators.
7. The operator should issue a summary of this report to all Flight crew and should advise them that during periods of bad weather, a runway inspection can be requested prior to landing.