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GOVERNMENT OF INDIA

FINAL REPORT ON INCIDENT TO M/S.SPICE JET LTD.Q-400 AIRCRAFT VT-SUF AT CALICUT ON 04/08/2017

DIRECTORATE GENERAL OF CIVIL AVIATION
MINISTRY OF CIVIL AVIATION
NEW DELHI

FOREWORD

This document has been prepared based upon the evidences collected during the investigation, opinion obtained from the experts' examination of various components. The investigation has been carried out in accordance with Annex 13 to the convention on International Civil Aviation and under Rule 13 (1) of Aircraft (Investigation of Accidents and Incidents), Rules 2012 of India. The investigation is conducted not to apportion blame or to assess individual or collective responsibility. The sole objective is to draw lessons from this incident which may help to prevent such future accidents/incidents. Safety recommendation shall in no case create a presumption of blame or liability for an occurrence.

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FINAL REPORT ON INCIDENT TO M/S.SPICE JET LTD. BOMBARDIER Q-400 AIRCRAFT VT-SUF AT CALICUT ON 04/08/2017

1. Aircraft
   - Type : DHC-8-402 (Q-400)
   - Nationality : INDIAN
   - Registration : VT-SUF

2. Owner/ Operator : Maple Leaf financing Ltd / Spice Jet Ltd

3. Pilot – in –Command : ATPL holder qualified on type
   Extent of injuries : Nil

4. First Officer : ATPL holder qualified on type
   Extent of injuries : Nil

5. Place of Incident : Calicut Airport ($11^0$08'17"N, $75^0$57'1.5"E)

6. Date & Time of Incident :04th August 2017 & 02:38 UTC (Approx.)

7. Last point of Departure : Chennai

8. Point of intended landing : Calicut

9. Type of operation : Scheduled Operation

10. Crew on Board : 04 + 01 supernumerary
    Extent of injuries : Nil

11. Passengers on Board : 70
    Extent of injuries : Nil

12. Phase of operation : Landing

13. Type of Incident : Runway Excursion

(ALL TIMING IN THE REPORT ARE IN UTC)

SYNOPSIS:

On 04th August 2017, M/s Spice Jet Ltd. Bombardier Q-400 aircraft VT-SUF, was operating a scheduled flight from Chennai to Calicut.

The aircraft took off from Chennai at around 0130 UTC and weather reported for Calicut was within the crew operating minima. There were 70 passengers, 04 crew members and 01 supernumerary on board the aircraft.

The takeoff and cruise was uneventful. However during approach at Calicut airport, ATC informed about moderate rain over airfield. Calicut ATC cleared VT-SUF aircraft for landing on RWY 10 though the runway in use was RWY 28, as requested by aircraft and traffic permitted with wind 310^0/04 kt. The aircraft landed on RWY 10 at around 0238 UTC. The aircraft after touchdown got veered off to the right of RWY 10 and impacted the runway edge lights.

In exercise of Power under Rule 13 (1) of, Aircraft (Investigation of Accidents and Incidents), Rules 2012, Director General of Civil Aviation appointed Inquiry Officer to investigate into the cause of the incident.

The investigation of incident reveals that, the probable cause of the incident was excessive rudder input by PIC to bring the aircraft on runway centerline while landing on wet runway led to runway excursion.

1. FACTUAL INFORMATION

1.1 History of the Flight

On 04th August 2017, M/s Spice Jet Ltd. Bombardier Q-400 aircraft with registration VT-SUF, was operating a scheduled flight SEJ 3251 from Chennai to Calicut under the command of ATPL license holder endorsed on type with duly qualified First Officer on type. There were 70 passengers, 04 crew members and 01 supernumerary on board the aircraft.

During the preflight MET briefing at Chennai, weather of Chennai, Calicut and Coimbatore was studied by crew and all NOTAMs were checked and weather reported for Calicut was within the crew operating minima.

P1 was the TRI/Examiner occupied right side seat and was conducting P1 SLF training for the P2. P2 occupied left side seat as a SLF (under training). At around 0120 UTC, aircraft pushed back from bay no.3 at Chennai. A normal start up and taxi was carried out. The aircraft took off from RWY 25 from Chennai at around 0130 UTC.

When the aircraft came in contact with HAL ATC, HAL ATC cleared aircraft for direct routing to CLC VOR. Thereafter aircraft came in contact with Cochin radar. The cruise was carried out at FL220. The enroute weather was normal and no significant clouds was encountered during cruise.

At around 34 nm from Calicut, aircraft came in contact with Calicut ATC and tower informed that expect ILS approach on RWY 28 but aircraft preferred for ILS approach on RWY 10. Based on the request of aircraft, ATC Calicut permitted for ILS approach on RWY 10 as wind and traffic permits. At around 10 nm from Calicut, the ATC Calicut reported runway surface condition was wet and visibility 3000 m.

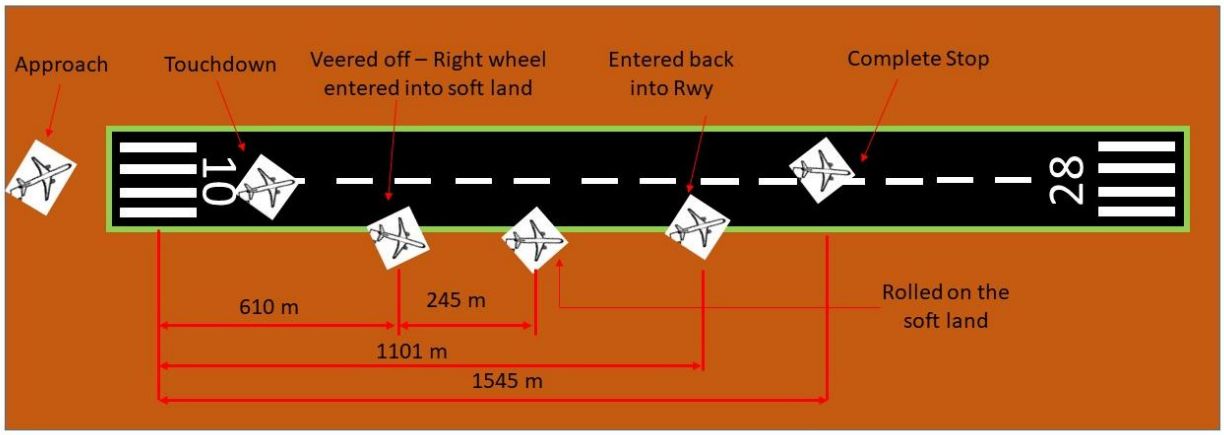
At around 0230 UTC, Calicut ATC informed that light rain over the field and at around 0233 UTC, Calicut ATC updated that moderate rain over the field. Under training pilot P2 was planned to fly this sector completely, however as a rain was moderate, P1 decided to carry out the landing in consultation with P2. At around 0235 UTC, Calicut ATC cleared VT-SUF aircraft for landing on RWY 10 though the runway in use was RWY 28, as requested by aircraft and traffic permitted with wind 310^0/04 kt.

As per the MET report, wind calm, visibility 3000 m and it was light to moderate rain at the time of landing.

The aircraft touchdown on RWY 10 at around 0238 UTC. The aircraft after touchdown got veered off to the right of RWY 10 and impacted the runway edge lights. At a distance of around 610 m from RWY 10 threshold, the aircraft wheel marking shows that the aircraft right wheel had entered into the soft land on the right of RWY 10 whereas left wheel of the aircraft rolled over on the shoulder of the RWY 10.

Further the right wheel of the aircraft had rolled for a distance of around 245 m on the soft land and at a maximum distance of 11.1 m from the right edge of the runway. Left wheel of the aircraft rolled on the shoulder of the RWY 10 and damaged the 05 runway edge lights. The first edge light broken due to aircraft impact was at a distance of 750 m from the threshold of RWY 10.

At a distance of 1101 m from RWY 10 threshold, the aircraft wheel markings show that the aircraft had entered back into the runway and at a distance of 1545 m from RWY 10 threshold, the aircraft had come to a complete stop. During this landing roll, aircraft had damaged 05 runway edge lights on right side.



Aircraft confirmed no need for any assistance required and was able to back track and reported all system parameters normal and brakes were also working.

At the time of incident, the Air Traffic Controller (ATCO) in contact with aircraft at Calicut ATC was under on job training. Immediately after the incident, trainer took over the R/T. As instructed by ATC, security jeep was sent for inspection and reported no visible damage to the aircraft. Runway edge lights were found broken and lot of glass pieces and mud observed on the runway.

Further, aircraft reported able to taxi. As instructed by ATC, aircraft vacated RWY 10 and parked on the bay no. 06. All persons on board were safe and there was no fire reported.

1.2 Injuries to persons

INJURIES	CREW	PASSENGERS	OTHERS
FATAL	Nil	Nil	Nil
SERIOUS	Nil	Nil	Nil
~~MINOR~~ / None	05	70	---

1.3Damage to aircraft

The aircraft had sustained minor damages. The damages observed are as follows.

- Left main landing gear tire No.1 and No.2 checked and found with deep cuts on both the tire.
- Small cuts and small glass pieces are found on the left nose wheel assembly.

- Nose landing gear checked and found scoring on the Left Hand side tow fitting assembly.
- Glass pieces were found on the left main landing gear No.1 brake assembly.
- Right Main landing gear checked and found grass and mud on the axial and brake assembly.

Deep Cut on the Left main Landing Gear Tire

Cut on the Left main Landing Gear Tire

Damage on the Left main Landing Gear Tire

1.4 Other damage

The left main landing gear impacted the runway edge lights and 05 lights were damaged.

Runway edge lights broken

1.5 Personnel Information:

1.5.1 Pilot in Command:

AGE	: 52 Years
Licence	: ATPL Holder
Date of Issue	: 01/02/2000
Valid up to	: 13/01/2022
Category	: Aero plane
Endorsements as PIC	: 26/12/2011 Q-400
Date of Med. Exam.	: 12/05/2017
Med. Exam valid upto	: 24/05/2018
FRTOL Date of Issue	: 01/02/2000
FRTOL Validity	: 04/12/2018
IR Test Done	: 15/10/2016
IR Test Due	: 14/10/2017
Total flying experience	: 8846:00 Hrs
Experience on type	: 5107:00 Hrs
Total flying experience during last 365 days	: 763:17 Hrs
Total flying experience during last 90 days	: 187:50 Hrs
Total flying experience during last 30 days	: 87:55 Hrs
Total flying experience during last 07 days	: 25:20 Hrs
Total flying experience during last 24 Hrs	: 05:10 Hrs
Duty time last 24 Hrs	: 06:28 Hrs
Rest before the flight	: 18:02 Hrs

1.5.2 Co-Pilot:

AGE	: 34 Years
License	: ATPL Holder
Date of Issue	: 07/04/2017
Valid up to	: 06/04/2022
Category	:Aero plane
Endorsements as PIC	: Cessna 152 A, P-68 C
Date of Med. Exam.	: 14/06/2017
Med. Exam valid upto	: 22/06/2018
FRTOL Date of Issue	: 21/01/2011
FRTOL Validity	: 20/01/2021
IR Test Done	: 15/07/2017
IR Test Due	: 14/07/2018
Total flying experience	: 3740:00 Hrs
Experience on type	: 3500:00 Hrs
Total flying experience during last 365 days	: 874:37 Hrs
Total flying experience during last 90 days	: 170:42 Hrs
Total flying experience during last 30 days	: 41:54 Hrs
Total flying experience during last 07 days	: 12:27 Hrs
Total flying experience during last 24 Hrs	: 01:30 Hrs
Duty time last 24 Hrs	: 02:00 Hrs
Rest before the flight	: 34:15 Hrs

Both the operating crew were not involved in any serious incident/ accident in the past. The licenses of both the cockpit crew and all the training were current and valid. Both the crew had adequate rest prior to roster for the incident flight.

1.6 Aircraft Information

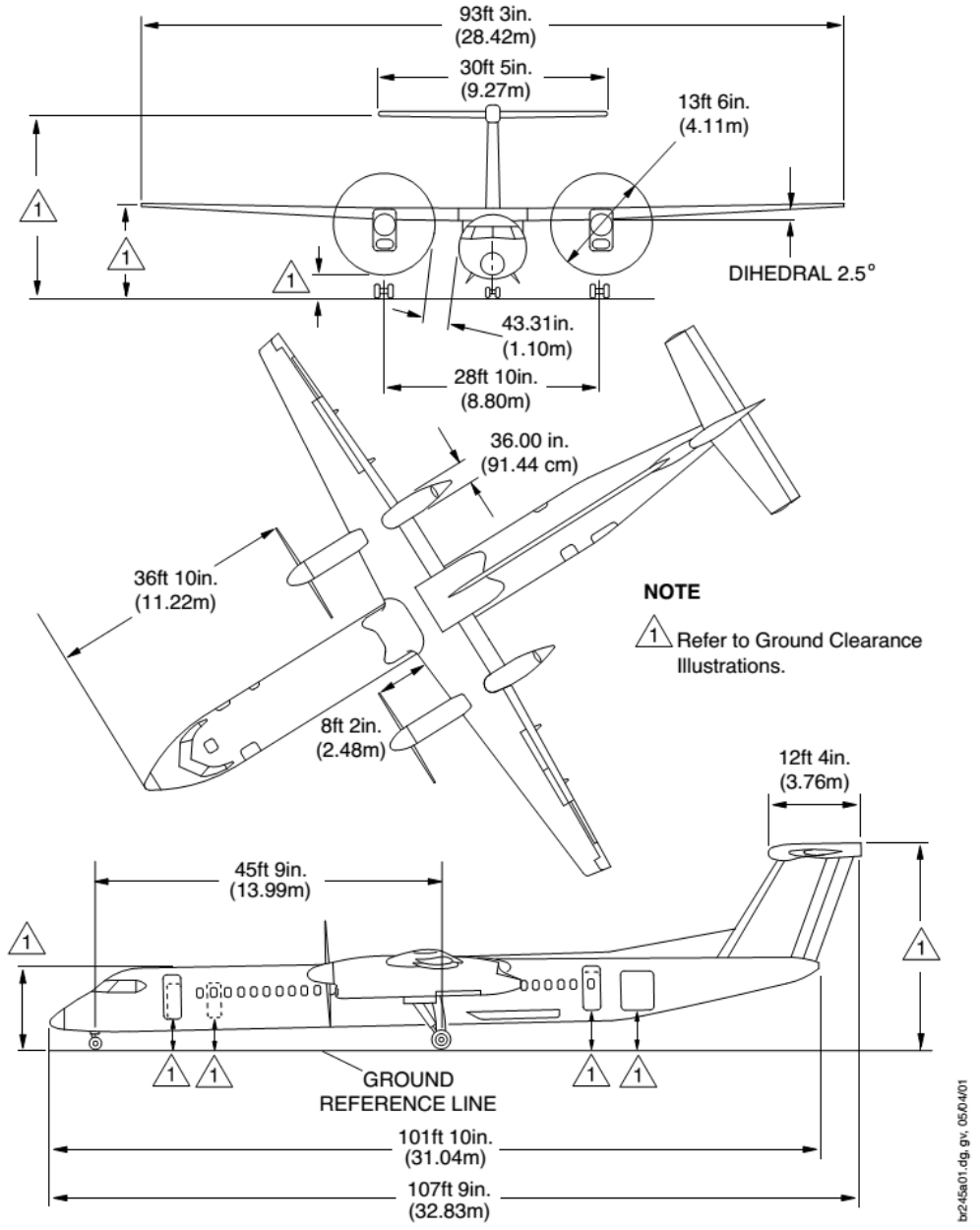
The aircraft is a metal high winged monoplane with fully cantilever wings and horizontal stabilizer surfaces, a semi−monocoque fuselage and a fully retractable tricycle landing gear. A large portion of the skin panels are bonded assemblies consisting of a skin, stringers and doublers, or skin sandwich with a honeycomb core.

The two nacelles, one on each side of the fuselage, mounted below the wing, house the power plants; accommodate the landing gears and some additional equipment. The nacelle comprises the following three main areas of structure i.e. Forward, Centre and Aft. The center nacelle structure which is located between nacelle stations 121.230 and 210.000 houses the A−Frame which attaches to MLG 12 drag−strut and side−braces. The A−Frame is machined from a solid aluminum alloy billet.

The landing gear is electrically controlled and hydraulically operated. The tricycle gear is a retractable dual wheel installation. The main gears retract aft into the nacelles and the nose gear retracts forward into the nose section. Doors completely enclose the landing gear when it is retracted and partially enclose the gear when it is down.

Aircraft VT-SUF (MSN 4382) was manufactured in year 2011 and was registered with DGCA under the ownership of M/S Maple Leaf Financing Limited. The aircraft is registered under Category 'A' and the Certificate of registration No. 4259 with valid upto 18.10.2023.

The Certificate of Airworthiness Number 6368 under "Normal category" subdivision Passenger / Mail / Goods was issued by DGCA on 21.10.2011. The specified minimum operating crew is two and the maximum all up weight is 29257 Kg. At the time of incident the Certificate of Airworthiness was current with unlimited validity.



Aircraft Dimensions
Figure 102

The Aircraft was holding a valid Airworthiness Review Certificate ARC Reference: SUF/6368/ARC/2014/024 valid upto 04.11.2017 and Aero Mobile License No. A-010/038-RLO (NR) at the time of incident. This aircraft was operated under Scheduled Operator's Permit No S-16 which was valid up to 16.05.2018. As on 04.08.2017 the aircraft had logged 15566 Airframe Hours and 14798 cycles.

The Bombardier Q400 aircraft and its engines are being maintained as per the maintenance program consisting of calendar period/ flying Hours or Cycles based maintenance as per maintenance program approved by Regional Airworthiness office, Delhi.

Accordingly, the last major inspection (4000 FH check) carried out at on 31.07.2017. Subsequently all lower inspections (Preflight checks, 50 FH Inspections) were carried out as and when due before the incident.

The aircraft was last weighed on 07.12.2016 at Chennai and the weight schedule was prepared and duly approved by the office of Deputy Director General, DGCA, Delhi. As per the approved weight schedule, the Empty weight of the aircraft is 17724.78 Kg. Maximum Usable fuel Quantity is 5318 Kg. Maximum payload with fuel tanks full is 5636.42 Kg. Empty weight CG is 9.99 m aft of datum. As there has not been any major modification affecting weight & balance since last weighing, hence the next weighing is due on 06.12.2021. Prior to the incident flight the weight and balance of the aircraft was well within the operating limits.

All the concerned Airworthiness Directive, mandatory Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engine has been complied with as on date of event.

Preflight inspections are carried out as per approved Inspection schedules and pre departure checks were normal besides one carried forward MEL for No.1 AC Generator.

The last fuel microbiological test was done through Fuel stat test kit on 12.09.2016 at Delhi by Spice Jet Certifying staff and the microbiological growth was negligible.

The left Engine S/N PCE-FA0821 had logged 13386:13 Hrs and 12736 cycles and the right Engine S/N FA0879 had logged 11972:47 Hrs and 11723 cycles. There was no defect report on the engine on the previous flight.

1.7 Meteorological information:

The following is the Met report of Calicut Airport on the date of incident between 0200 UTC to 0300 UTC

Time (UTC)	Wind Dir	Wind Speed (kt)	Visibility (m)	Weather	QHN
0200	0	0	3000	FBL RA	1009
0230	030	03	3000	FBL RA	1009
0255	0	0	2000	FBL RA	1009
0300	0	0	2000	FBL RA	1009

No significant weather indicated in the met report on the date of incident between 0200 to 0300 UTC. The runway condition was wet.

1.8 Aids to navigation:

There is one single runway available at Calicut which has the orientation 10/28. For landing runway 10/28 VORDME approach is available. PAPI is available for both sides of the runway. NDB is also available at Calicut for approach and landing. The ATC is controlled and manned by Airports Authority of India.

1.9 Communications:

There was always two way communications between the ATC and the aircraft.

1.10 Aerodrome information:

Calicut airfield and ATC are controlled by Airports Authority of India. The Calicut ATC has 24 Hrs watch hours. It has one single runway with orientation 10/28 and is 2860 m in length. The aerodrome elevation is about 332 feet AMSL. The airfield is equipped to provide VOR/DME approach on either side of the runway. The PAPI and NDB is also available for the runway 10/28. The aerodrome was licensed on 29.06.2007 and subsequently renewed. The last renewal was 29.06.2017 and was valid till 28.06.2019. The aerodrome license was valid at the time of incident.

1.11 Flight recorders:

The Cockpit Voice Recorder (CVR) and the Digital Flight Data Recorder (DFDR) was downloaded and the following information was available from them.

CVR:

- When the aircraft came in contact with HAL ATC, HAL ATC cleared aircraft for direct routing to CLC VOR.
- At around 0222 UTC, aircraft came in contact with Calicut ATC and reported 34 miles inbound Radial 077.
- Initially Calicut ATC informed that expect ILS approach on RWY 28. Aircraft preferred for ILS approach on RWY 10 and requested for wind condition.
- As requested by aircraft, ATC Calicut permitted for ILS approach on RWY 10.
- At around 10 nm from Calicut, the ATC Calicut reported runway surface condition was wet and visibility 3000 m.
- At around 0230 UTC, Calicut ATC informed that light rain over the field.
- At around 0233 UTC, Calicut ATC updated that moderate rain over the field.
- At around 0235 UTC, Calicut ATC cleared aircraft for landing on RWY 10 with wind 310^0/04 kt.
- At around 0238 UTC, tower contacted aircraft and asked for any assistance required.
- Aircraft confirms no any assistance required and able to back track.
- At around 0242 UTC, aircraft reported all normal indications and brakes are also working.

The CVR was downloaded and replayed. CVR indicates that the flight was proceeding normally with all callouts and procedures till 1000 ft. It is inferred from the CVR replay that, there was always two way communications between the PIC and first officer. Throughout the flight, the conversation between the PIC and first officer was normal and no abnormality found. However, replay of CVR reveals that, when localizer deviation was more than 1(one) dot, there was no call out made by P2 (Pilot Monitoring).

DFDR:

Following findings were made from the DFDR analysis.

- **At 02:36:40 UTC**

  - Auto pilot was disengaged at 835'ft RA
  - Speed (CAS) was 129 kt
  - Aircraft Heading 98.1^0
  - Pitch was up 2.6^0
  - Power lever Left 45^0 with torque 12 %
  - Power lever Right 45^0 with torque 13 %
  - Rudder pedal position was 0.2 right and rudder position was 0.4^0 right.
  - Aircraft roll to 0.8^0 right from 0.4^0 left.
  - Localizer deviation was FR0.06

- **At 02:37:07 UTC**

  - Aircraft was at 513 ft RA
  - Speed (CAS) was 132 kt
  - Aircraft Heading 95^0
  - Pitch was up 2.3^0
  - Power lever Left 45^0 with torque 11.5 %
  - Power lever Right 45^0 with torque 13 %
  - Rudder pedal position was 0.1 right and rudder position was 0.2^0 right.
  - Aircraft roll to 2.2^0 left.
  - **Localizer deviation was FR^0.87**

- **At 02:37:17 UTC**

  - Aircraft was at 281 ft RA
  - Speed (CAS) was 127 kt
  - Aircraft Heading 103.6^0
  - Pitch was up 4.7^0
  - Power lever Left 44^0 with torque 7.5 %
  - Power lever Right 44^0 with torque 8.5 %
  - Rudder pedal position was 0.1 right and rudder position was 0.7^0 right.
  - Aircraft roll to 8.8^0 right.
  - **Localizer deviation was FR 1.88**
  - Wind was 322^0 /10 kt

- **At 02:37:27 UTC (03 Sec before Touchdown)**

  - Aircraft was at 08 ft RA
  - Speed (CAS) was 117 kt
  - Aircraft Heading 108.6^0
  - Pitch was up 7.8^0
  - Power lever Left 42.5^0 with torque 7 %
  - Power lever Right 42^0 with torque 9.5 %
  - Rudder pedal position was 1.7 right and rudder position was 4.2^0 right.
  - **Aircraft roll to 6.7^0 left**.
  - **Localizer deviation was FR 0.20**
  - **Vertical Acceleration was 1.77g**

- **At 02:37:30 UTC (Touchdown)**

  - Aircraft main wheel touched down.
  - Speed (CAS) was 117 kt
  - **Aircraft Heading 96.3^0**
  - Pitch was up 2.0^0
  - Power lever Left 30.4^0 with torque -2.5 %
  - Power lever Right 25.8^0 with torque -1.5 %
  - Rudder pedal position was 4.2 right and rudder position was 15.3^0 right.
  - Aircraft roll to 0.4^0 right.
  - Wind was 330^0 /09 kt
  - **Localizer deviation was FL 0.54**
  - Vertical Acceleration was 0.77g

  Note: Runway heading was 103^0.

- **At 02:37:31 UTC (Nose Down)**

  - Aircraft Nose wheel down.
  - Speed (CAS) was 114 kt
  - Aircraft Heading 93.3^0
  - Pitch was down 0.7^0
  - Power lever Left 23^0 with torque -2.5 %
  - Power lever Right 24^0 with torque -2 %
  - Rudder pedal position was 8.9 right and rudder position was 18.4^0 right.
  - Aircraft roll to 1.2^0 right.
  - Vertical Acceleration was 1.08g

  Note: Nose wheel touched after one second of main wheel touched down.

- **At 02:37:34 UTC**

  - Aircraft Heading 90.1^0
  - Rudder pedal position was 9.1 right and rudder position was 22^0 right.
  - Lateral Acceleration was 0.27g left

1.12 Wreckage and impact information:

As per the evidences collected at the incident site, the aircraft after touchdown got veered off to the right of RWY 10 and impacted the runway edge lights. At a distance of around 610 m from RWY 10 threshold the aircraft wheel marking shows that the aircraft right wheel had entered into the soft land on the right of RWY 10 and whereas left wheel of the aircraft rolled over on the shoulder of the RWY 10. Further the right wheel of the aircraft had rolled for a distance of around 245 m on the soft land and at a maximum distance of 11.1 m from the right edge of the runway. Left wheel of the aircraft rolled on the shoulder of the RWY 10 and damaged the 05 runway edge lights. The first edge light broken due to aircraft impact was at a distance of 750 m from the threshold of RWY 10.

Aircraft right wheel entered into soft land

At a distance of 1101 m from RWY 10 threshold the aircraft wheel markings show that the aircraft had entered back into the runway and at a distance of 1545 m from RWY 10 threshold, the aircraft had come to a complete stop. During this landing roll aircraft had damaged 05 runway edge lights on right side.

1.13 Medical and pathological Information:

Both the pilots had undergone preflight breath analyzer medical check prior to the flight at Chennai and the same was negative. Both the pilots had undergone post flight breath analyzer medical check after the incident at Calicut and the same was also negative.

1.14 Fire:

There was no fire after the incident.

1.15 Survival aspects:

The incident was survivable.

1.16 Tests and research:

NIL

1.17 Organizational and management information:

M/s Spice jet Ltd. is a scheduled airline with a fleet of 02 Boeing 737-700, 28 Boeing 737-800, 04 B737-900 aircraft and 21 Bombardier Q-400 aircraft operating flights on domestic and international sectors. The Airlines Head Quarter is located at New Delhi. The Air operator permit of the Airlines is valid till 30/06/2018. The Company is headed by Chief Executive Officer assisted by a team of professional of various departments. The Flight Safety Department is headed by Chief of Flight Safety approved by DGCA. The Chief of Safety is senior management official who reports directly to the CEO.

M/s Spice jet has a full established operations training facility for the pilots. The training facility for both Boeing pilots and Bombardier Q-400 pilots is setup at Delhi. The training facilities are headed by the senior vice president operations who reports to Chairman directly. The Engineering training facility is established at Delhi for B737 aircraft and Hyderabad for Q-400 aircrafts.

1.18 Additional information:

As per spice Jet Operations Manual Part A (General), Chapter 25 – Stabilized Approach Procedure, para A25.1.3 (Significant Deviation) says that "Localizer 01 dot deviation is consider to be significant deviation and it is the responsibility of the pilot monitoring to give call out for significant deviation". However, replay of CVR reveals that no call out was made by P2 (Pilot Monitoring).

1.19 Useful or effective investigation techniques:

NIL

2. ANALYSIS

2.1 Serviceability of the aircraft:

Aircraft VT-SUF (MSN 4382) was manufactured in year 2011. The aircraft was registered with DGCA. At the time of incident; the Certificate of Airworthiness, Airworthiness Review Certificate and Certificate of Registration was current and valid.

This aircraft was operated under Scheduled Operator's Permit No S-16 which was valid up to 16.05.2018. As on 04.08.2017, the aircraft had logged 15566 Airframe Hours and 14798 cycles. The aircraft and its engines were being maintained as per the maintenance program approved by Regional Airworthiness office, Delhi.

The Q-400 aircraft and Engines are being maintained under continuous maintenance as per maintenance program consisting of calendar period based maintenance and Flying Hours / Cycles based maintenance as per maintenance program approved by Office of DDG, DGCA, Northern region. Accordingly the last major inspection for 4000 FH was carried out on 31.07.2017. Subsequently all lower inspections, after last flight inspection and preflight checks were carried out as and when due before the incident.

All the concerned Airworthiness Directive, Service Bulletins, DGCA Mandatory Modification on this aircraft and its engine have been complied with as & when due. Prior to the incident flight the weight and balance of the aircraft was well within the operating limits.

Preflight inspections are carried out as per approved Inspection schedules and pre departure checks were normal besides one carried forward MEL for No.1 AC Generator.

From the above it is inferred that the serviceability of the aircraft is not a factor to the incident.

2.2 Weather:

Prior to take off from Chennai, the weather was fine. The aircraft took off from Chennai at around 0130 UTC and weather reported for Calicut was within the crew operating minima. At about 4000 ft, ATC reported light rain over the field. At around 0230 UTC, Calicut ATC informed that light rain over the field. At around 0233 UTC, Calicut ATC updated that moderate rain over the field. At around 0235 UTC, Calicut ATC cleared aircraft for landing on RWY 10 with wind 310^0/04 kt. There was not much of cross winds reported. Although the flight crew has reported that they experienced moderate rain and winds were 12-15 kt at 330^0.

The relevant METAR is as follows:

Time (UTC)	Wind Dir	Wind Speed (kt)	Visibility (m)	Temp (^{0}C)	Weather	QHN
0200	0	0	3000	24	FBL RA	1009
0230	030	03	3000	24	FBL RA	1009
0255	0	0	2000	24	FBL RA	1009
0300	0	0	2000	24	FBL RA	1009

The DFDR data also indicates that the winds were 330^0/09 kt. Weather at the time of occurrence was light to moderate rain.

2.3 Pilot Handling of the Aircraft:

During the preflight MET briefing at Chennai, weather of Chennai, Calicut and Coimbatore was studied by crew and all NOTAMs were checked and weather reported for Calicut was within the crew operating minima. P1 was the TRI/Examiner occupied right side seat and was conducting P1 SLF training for the P2. P2 occupied left side seat as a SLF (under training).

At around 34 nm from Calicut, aircraft came in contact with Calicut ATC and tower informed that expect ILS approach on RWY 28 but aircraft preferred for ILS approach on RWY 10. Based on the request of aircraft, ATC Calicut permitted for ILS approach on RWY 10 as wind and traffic permits. At around 10 nm from Calicut, the ATC Calicut reported runway surface condition was wet and visibility 3000 m.

At around 0230 UTC, Calicut ATC informed that light rain over the field and further updated moderate rain over the field. Under training pilot P2 was planned to fly this sector completely, however as a rain was moderate, P1 decided to carry out the landing in consultation with P2. At around 0235 UTC, Calicut ATC cleared VT-SUF aircraft for landing on RWY 10 though the runway in use was RWY 28, as requested by aircraft and traffic permitted with wind 310^0/04 kt.

DFDR analysis revealed that at around 800'ft RA, auto pilot was disengaged. The approach course set on the control panel is set to 99^0 (selected heading) instead of 103^0 (Runway heading) to compensate for the cross wind component of 4^0 (Drift angle).

At around 500'ft RA, the crew gave left roll which makes the aircraft heading further away from runway heading 103^0 (aircraft heading changed from 99^0 to 94^0). The left roll leads to more than 01 (one) dot correction of localizer to the right (Max deviation was FR1.88). There after aircraft approach was unstable.

From DFDR, it is inferred that, the aircraft might had landed with a left roll of 6.7^0 which indicates left wheel touching first with vertical acceleration of 1.77g i.e 3 sec before the touchdown. The aircraft landed slightly right of the center line of the runway which clearly evident from localizer deviation was FL0.54. Right rudder applied upto 22^0 to orient the aircraft to the runway heading i.e. 103^0 (aircraft heading was 96.3^0 at the time of touch down).

Excessive right rudder input upto 22^0 given by PIC to bring the aircraft on runway centerline while landing on wet runway led to runway excursion.

2.4 Discussion on other possible scenarios:

All the possibilities which could have resulted into the incident were explored and are detailed as below:

- **Rudder Jam:**

Post incident discussion with the flight crew indicated that no rudder jam was suspected by the flight crew nor it was observed after post flight inspection by the engineering staff. DFDR data also indicated that rudder movement was consistent with the rudder pedal inputs. This rules out the Rudder Jam as a cause of the incident.

- **Rudder Pedal Stiff:**

Post incident discussion with the flight crew indicated that no rudder stiffness was experienced by the flight crew. This rules out the Rudder pedal stiff as a cause of the incident.

- **Nose Wheel Steering fault:**

No Nose Wheel Steering fault was recorded in flight and Post incident discussion with the flight crew indicated that no Nose Wheel Steering fault. After the incident, aircraft returned to bay no.6 without any assistance. This rules out the Nose wheel steering fault as a cause of the incident.

- **Skidding due to rubber deposits:**

No visible marks of skidding were observed post incident on the runway nor was it reported by the flight crew.

2.5 Correlation of CVR and DFDR:

The CVR was downloaded and replayed. CVR indicates that the flight was proceeding normally with all callouts and procedures till 1000 ft. The DFDR was also downloaded and analyzed. The flight was uneventful and auto pilot was disengaged at around 800 ft.

At around 500'ft RA, the crew gave left roll which makes the aircraft heading to 94^0 from 99^0 i.e further away from runway heading 103^0. The left roll leads to more than 01 (one) dot correction of localizer to the right (Max deviation was FR1.88). As per spice Jet Operations Manual, para A25.1.3, more than 01 dot deviation of Localizer is consider to be significant deviation and it is the responsibility of the pilot monitoring to call out for significant deviation. However, replay of CVR reveals that no call out was made by P2 (Pilot Monitoring).

2.6 Circumstances leading to the Incident :

At around 500'ft RA, The crew gave left roll which makes the aircraft heading to 94^0 from 99^0 i.e further away from runway heading 103^0. The left roll leads to more than 01 (one) dot correction of localizer to the right (Max Deviation was FR1.88). Below 500'ft RA, aircraft approach was unstable. The aircraft landed slightly right of the center line of the runway which clearly evident from localizer deviation was FL0.54. Right rudder applied upto 22^0 to orient the aircraft to the runway heading i.e. 103^0 (aircraft heading was 96.3^0 at the time of touch down).

Excessive right rudder input upto 22^0 given by PIC to bring the aircraft on runway centerline while landing on wet runway led to runway excursion. Then, the aircraft right wheel had entered into the soft land on the right of RWY 10 and whereas left wheel of the aircraft rolled over on the shoulder of the RWY 10.

3. CONCLUSIONS:

3.1 Findings:

i. The Certificate of Airworthiness and the Certificate of Registration of the aircraft was valid on the date of incident. The certificate of flight release was valid on the day of incident.

ii. The aircraft took off from Chennai at around 0130 UTC and weather reported for Calicut was within the crew operating minima. P1 was the TRI/Examiner occupied right side seat and was conducting P1 SLF training for the P2. P2 occupied left side seat as a SLF (under training).

iii. At around 34 nm from Calicut, aircraft came in contact with Calicut ATC and tower informed that expect ILS approach on RWY 28 and aircraft preferred for ILS approach on RWY 10.

iv. At around 10 nm from Calicut, the ATC Calicut reported runway surface condition was wet and visibility 3000 m. At around 0230 UTC, Calicut ATC informed that light rain over the field and further updated moderate rain over the field.

v. Under training pilot P2 was planned to fly this sector completely, however as a rain was moderate, P1 decided to carry out the landing in consultation with P2.

vi. At around 0235 UTC, Calicut ATC cleared VT-SUF aircraft for landing on RWY 10 though the runway in use was RWY 28, as requested by aircraft and traffic permitted with wind 310^0/04 kt.

vii. At around 800'ft RA, auto pilot was disengaged. At around 500'ft RA, the crew gave left roll which makes the aircraft heading further away from runway heading 103^0 (aircraft heading changed from 99^0 to 94^0). The left roll leads to more than 01 (one) dot correction of localizer to the right (max deviation was FR1.88). There after aircraft approach was unstable.

viii. As per spice Jet Operations manual, para A25.1.3, more than 01 dot deviation of Localizer is consider to be significant deviation and it is the responsibility of the pilot monitoring to call out for significant deviation. However, replay of CVR reveals that no call out was made by P2 (Pilot Monitoring).

ix. From DFDR, it is inferred that, the aircraft might had landed with a left roll of 6.7^0 which indicates left wheel touching first with vertical acceleration of 1.77g i.e 3 sec before the touchdown. The aircraft landed slightly right of the center line of the runway which clearly evident from localizer deviation was FL0.54. Right rudder applied upto 22^0 to orient the aircraft to the runway heading i.e. 103^0 (aircraft heading was 96.3^0 at the time of touch down).

x. The aircraft right wheel had entered into the soft land on the right of RWY 10 and whereas left wheel of the aircraft rolled over on the shoulder of the RWY 10.

xi. The DFDR data indicates that the winds were 330^0/09 kt. Weather at the time of occurrence was light to moderate rain.

xii. During this landing roll aircraft had damaged 05 runway edge lights on right side. Aircraft reported able to back track and all system parameters were checked & normal and brakes were also working.

xiii. At the time of incident, the Air Traffic Controller (ATCO) was in contact with aircraft at Calicut ATC was under on job training. Immediately after the incident, trainer took over the R/T.

xiv. As instructed by ATC, Security jeep was sent for inspection and reported no visible damage to the aircraft and runway edge lights were broken and lot of glass pieces and mud observed on the runway.

xv. Further, aircraft reported able to taxi. As instructed by ATC, aircraft vacated RWY 10 and parked on the bay no. 06. All persons on board were safe and there was no fire reported.

3.2 Probable cause of the incident:

Excessive rudder input by PIC to bring the aircraft on runway centerline while landing on wet runway led to runway excursion.

Unstabilised approach coupled with non-adherence to standard callouts by Pilot monitoring was the contributory factor to the incident.

4. SAFETY RECOMMENDATIONS:

1) Action, in view of finding as deemed fit may be taken by DGCA.

2) The operator should issue a circular to emphasize the use of standard callouts and check during annual refresher.

(Sudhan Uthirapathy)
Inquiry Officer

Date: 13th July 2020
Place: Chennai