



सत्यमेव जयते

GOVERNMENT OF INDIA

CIVIL AVIATION DEPARTMENT

FINAL INVESTIGATION REPORT

**INCIDENT OF RUNWAY EDGE LIGHT DAMAGE BY M/s SPICE JET
B-737-800 AIRCRAFT VT-SYI AT KOLKATA ON 02-07-2019**

O/o Dy. Director General of Civil Aviation (ER)

Air Safety Directorate, NSCBI Airport,

Kolkata – 700052

INDEX

Item No.	Description	Page No.
	Index	i
	Foreword	iii
	Abbreviations	iv
	Preliminary Information	1
	Synopsis	1
1.	Factual Information	2
1.1	History of Flight	2
1.2	Injuries to persons	3
1.3	Damage to Aircraft	3
1.4	Other damages	4
1.5	Personal information	5
1.6	Aircraft information	7
1.7	Meteorological information	8
1.8	Aids to Navigation	9
1.9	Communication	9
1.10	Aerodrome information	9
1.11	Flight Recorders	10
1.12	Wreckage and impact information	12
1.13	Medical and pathological information	12
1.14	Fire	13
1.15	Survival Aspects	13
1.16	Test and Research	13
1.17	Organisational and management information	13
1.18	Additional information	13
1.19	Useful and effective investigation techniques	14
2.	Analysis	14
2.1	Flight crew and Aircraft operations	14
2.2	Weather	16
2.3	Maintenance aspects of aircraft	16
2.4	Circumstances leading to the incident	17

INDEX (Continued)

Item No.	Description	Page No.
3.	Conclusion	17
3.1	Findings	17
3.2	Probable cause of the incident	19
4.	Safety Recommendation	19
	Appendix A (Photographs)	20-21
	Appendix B (Photographs)	22-25

FOREWORD

This document has been prepared based upon the evidences collected during the investigation, opinion obtained from the experts and examination of various aeronautical documents. The investigation has been carried out in accordance with Annex 13 to the convention on International Civil Aviation.

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 recurrence of such future incidents.

ABBREVIATIONS

Abbreviation	Expanded form
AFE	Airfield Elevation
AMM	Aircraft Maintenance Manual
ASDA	Aircraft Stop Distance Available
ATPL	Airline Transport Pilot Licence
ATC	Air Traffic Control
CAS	Corrected Air Speed
CAT	Category
CPL	Commercial Pilot Licence
CVR	Cockpit Voice Recorder
DFDR	Digital Flight Data Recorder
DME	Distance Measuring Equipment
DGCA	Directorate General of Civil Aviation
DVOR	Doppler Very High Frequency Omni Range
FDTL	Flight and Duty Time Limitation
hPa	Hectopascal
ILS	Instrument Landing System
IMD	India Meteorological Department
INS	Inches
IST	Indian Standard Time
KT, kt	Knots
L/H, LH, LHS	Left Hand Side
LDA	Landing distance available
M	Metres
MWA	Main wheel assembly
R/H, RH, RHS	Right Hand Side
RA	Rain
RADAR	Radio Detection and Ranging
S/SE	South/ South East
TODA	Take-off distance available
TORA	Take-off run available
UTC	Coordinated Universal Time
Vref	Reference speed
19L	Name of runway end at Kolkata Aerodrome

INCIDENT OF RUNWAY EDGE LIGHT DAMAGE BY M/s SPICE JET

B-737-800 AIRCRAFT VT-SYI AT KOLKATA ON 02-07-2019

1.	Aircraft	Type	Boeing-737-800
		Nationality	Indian
		Registration	VT-SYI
2.	Owner and operator	Owner: M/s AS AIR LEASE 41(IRELAND) LIMITED. Operator: M/s SPICE JET LIMITED.	
3.	Pilot-in-Command	ATPL Holder	
	Extent of injuries	None	
4.	Co-pilot	CPL holder	
	Extent of injuries	None	
5.	Passengers on board	160	
	Extent of injuries	None	
6.	Date & time of Incident	02.07.2019; 0903 UTC (approx)	
7.	Place of Incident	Kolkata Airport	
8.	Co-ordinates of place of incident	Latitude 223914 N; Longitude 0882648E.	
9.	Last point of departure	Pune Airport	
10.	Intended place of landing	Kolkata Airport	
11.	Type of operation	Scheduled commercial operation (Domestic).	
12.	Phase of operation	Landing roll	
13.	Type of Incident	Abnormal Runway Contact (ARC).	

(All time values are in UTC)

SYNOPSIS:

M/s Spicejet Boeing-737-800 aircraft registration VT-SYI operating flight SG-275 of 02.07.2019, sector Pune- Kolkata, made approach for landing at Kolkata airport runway 19 L . The runway was wet. Before touchdown, the aircraft was not aligned with the runway centreline and its heading was slightly towards right w.r.t the centreline. The aircraft touched down near RHS marking of 'Aiming Point' abeam taxiway 'K' and rolled on towards right edge of the runway 19L. The aircraft rolled along the RHS shoulder of the runway between taxiway 'K' and taxiway 'A' and damaged 05 runway edge lights. The pilot then applied corrections and the aircraft was manoeuvred towards centre line of the runway. The aircraft finally vacated runway via taxiway 'R'. The aircraft taxied to bay 28 and was

parked there. All passenger disembarked safely in the bay. There was no injury to any of the passengers or crew members. There was no injury to any person outside the aircraft. Main wheel no. 03 and 04 were found with cut marks at several places. Bearing cover of no. 2 main wheel came out. The incident of runway edge light damage occurred at 09:03:00 UTC approx. on 02.07.2019. The aircraft was subjected to maintenance action and released for further service on 02.07.2019.

The incident has been investigated in pursuant to DGCA HQ Order no. DGCA-15018(7)/17/2019-DAS dated 06.08.2019. The incident occurred because the flight crew encountered cross wind during flare and did not maintain aircraft heading along the runway centreline. As a result the aircraft drifted from the runway centreline and landed at the aiming point towards the right side on the runway. After landing, the aircraft further drifted towards the right edge of the runway and damaged runway edge lights. Weather was a contributory factor to the incident.

1. FACTUAL INFORMATION:

1.1. History of flight:

1.1.1 M/s Spicejet B-737-800 aircraft registration VT-SYI was operating flight SG-275 of 02.07.2019 in sector Pune–Kolkata. The aircraft departed from Pune at 0620 UTC and was airborne at 0628 UTC. The flight was uneventful during cruise from Pune to Kolkata. After arriving over Kolkata, the aircraft made an approach for landing at Kolkata runway 19L and it was cleared to land at 09:02:01 UTC by ATC. As informed by Kolkata ATC, the wind direction was 150° and wind speed was 18 kt. The wind speed was within permissible limit of ‘crosswind’ for landing. It was raining over the airfield. The aircraft touched down at 09:02:53 UTC at a ground speed of 146 kt. After touchdown, the aircraft rolled towards right edge of the runway 19L and continued its roll along shoulder of the runway between taxiway ‘K’ and taxiway ‘A’ and damaged 05 runway edge lights. While rolling along the shoulder of the runway ‘reverse thrust’ was deployed. The pilot realized that the aircraft had reached near the right edge of the runway and he manoeuvred the aircraft back on runway centre line. The damage to runway lights occurred at 09:03:00 UTC approx. The aircraft completed its landing roll and vacated the runway via taxiway ‘R’; as instructed by the ATC. After vacating runway, the pilot informed ATC that some runway edge lights were suspected to be damaged and the same be inspected. The aircraft taxied to its allocated bay no. 28 and got parked.

1.1.2. There were 160 passengers, 02 flight crew and 05 cabin crew on board the aircraft. All passengers, flight crew and cabin crew disembarked from the aircraft safely.

1.2 Injuries to Persons:

Injuries	Crew	Passengers	Others
Fatal	Nil	Nil	Nil
Serious	Nil	Nil	Nil
Minor / None	Nil /07	Nil / 160	

1.3 Damage to the Aircraft: There were cut marks on several places on No. 03 and 04 tyres of the RH main wheel. The bearing cover of No. 02 main wheel was found damaged.



Cut Marks on no.3 main wheel tyre



Cut Marks on no. 4 main wheel tyre.

1.4 Other damage: 05 runway edge lights on the right edge of runway 19L between taxiway 'K' and 'A' were damaged. Information of the damaged lights is given below:

Damage Sequence	Fitting no.	Distance from runway 19 L threshold
First runway edge light damaged	Fitting No. REH-02-42	806.03 metres
Second runway edge light damaged	Fitting No. REH-01-44	836.03 metres
Third runway edge light damaged	Fitting No. REH-02-44	866.03 metres
Fourth runway edge light damaged	Fitting No. REH-01-46	896.03 metres
Fifth runway edge light damaged	Fitting No. REH -02-46	926.03 metres

1.5. Personnel Information:

1.5.1. Pilot –in- Command

Age	28 Years03 Month / Male
Type of licence	ATPL Holder
Date of Issue	27.10.2017
Valid upto	26.10.2022
Category	Aeroplanes
Aircraft Ratings	B 737 700/800/900
Date of Endorsement as PIC	16.08.2018
Date of last Annual Medical Exam	13.02.2019
Medical Exam validity	19.02.2020
FRTTO Licence issued on	21.12.2010
FRTTO Licence valid up to	20.12.2020
Instrument Rating	14.05.2019
Total Flying Hours Experience	5212:17 Hrs
Total Flying Hours in 01 year	639:03
Total flying experience in last 180 days	284:55Hrs
Total flying experience in last 30 days	75:12 Hrs
Total flying experience in last 7 days	17:35Hrs
Total flying experience in last 24 hrs.	06: 34Hrs
Rest before duty	17:00 Hrs

1.5.2. Co- Pilot:

Age	27 Years 07 Month / Female
Type of licence	CPL Holder
Date of Issue	09.03.2016
Valid upto	08.03.2021
Category	Aeroplanes
Aircraft Ratings	B 737 700/800/900
Date of Endorsement as Co-Pilot	23.02.2017
Date of last Annual Medical Exam	02.03.2019
Medical Exam validity	01.03.2020
FRTTO Licence valid up to	08.03.2021
Instrument Rating	19.01.2019
Flying Hours Experience	800:54 Hrs
Total flying Hours in 01 year	554:35 Hrs
Total flying experience in last 180 days	85:22 Hrs
Total flying experience in last 30 days	74:46 Hrs
Total flying experience in last 7 days	13:36 Hrs
Total flying experience in last 24 hrs.	07:17Hrs
Rest before duty	17:30 Hrs

1.6. Aircraft information:

1.6.1. Aircraft Basic Information:

AIRCRAFT:- VT-SYI	
Manufacturer	Boeing
Type	737-800
Owner/Lessor	M/s AS AIRLEASE 41(IRELAND) LIMITED, FIRST FLOOR, HUME STREET, DUBLIN 2, IRELAND.
Operator	M/s SPICEJET LIMITED, 319, UDYOG VIHAR, PHASE-IV, GURGAON-122016, HARYANA, INDIA.
Manufacturer Serial no.	33555
Year of Manufacture	08.01.2004
Certificate of Airworthiness	7183
Airworthiness Review Certificate	4-57/2019-AI (1)/ARC/7183, valid up to 03.05.2020.
Category	A
Certificate of Registration and validity	5080 / 18.09.2022
Minimum Crew Required	2
Maximum All Up weight	70533 kg
Last Major inspection	A Check, 27.06.2019
Airframe Hours since new	53497:33 Hrs
Airframe Hours Since last C of A	660:38 Hrs (03 May 2019 to 02 July 2019)

1.6.2: Engine Basic Information:

<u>Engine:-</u>	<u>LH</u>	<u>RH</u>
Manufacturer	SAFRAN AIRCRAFT ENGINES	SAFRAN AIRCRAFT ENGINES
Type	CFM56-7B	CFM56-7B
Engine Serial no.	891647	874563
Time Since New	53751:39 Hrs	36302:38 Hrs
Time Since Overhaul	14541 Hrs	13993 Hrs
Last Major Inspection Carried out	Shop visit: Repaired 23-NOV-15	Shop visit: Repaired 20-AUG-15
Last inspection Carried out	Service Check, 01-Jul-2019	Service Check, 01-Jul-2019

1.6.3. The actual take-off weight of the aircraft was 70188 kg and maximum take-off weight was 70533 kg. The aircraft was not over loaded. The actual landing weight of the aircraft was

63414 kg and maximum landing weight was 65317 kg. Therefore the aircraft landed below its maximum permissible landing weight.

1.6.4. After the aircraft was parked in the bay, the pilot-in-command made following entry in Tech log: “After landing the runway centreline markings and runway edge lights were not visible due heavy rain. Suspected R/H main landing gear touched runway edge lights. Same reported to ATC. Found 04 lights broken. And post flight walk around found damage on R/H landing gear. All engine parameters were normal.”

Following was the rectification carried out on the aircraft before release, “Noted, on T/S found #2 MWA bearing and tube cap damaged, and #3 & #4 MWA tyre having multiple cut marks. None tyre found deflated. External visual inspection carried out on Engine and fuselage, found no damage. DFDR & CVR down loading carried out. Found ‘g’ value 1.5 at roll angle 7. Hard landing / Overweight landing inspection carried out as per AMM 5-51-01 Phase -1A & 1B. Found no damage. Both 1& 2 MWA replaced. Wheel #2 brake replaced. #3 & #4 MWA replaced. AMM 32-45-11 & 32-41-41.”

1.6.5. Type of fuel used is JET A 1(Aviation Turbine Fuel).

1.7. Meteorological information:

1.7.1. Met report at 0900 UTC on 02.07.19 for Kolkata airport is appended below:

Wind: 130/12 KT	Visibility: 3000 M	Weather: RA
Cloud 1: SCT 1500 FT	Cloud 2: FEW CB 3000 FT	
Cloud 3: BKN 10000 FT		
Temperature: 31° C	QNH: 0995 hPa 29.40 INS	
Dew Point: 29°C	FEE : 0995 hPa 29.38 INS	
Trend: TEMPO 2000 RA		
Remarks: CB to S/SE		

It was raining over the airfield at the time of landing of the aircraft.

1.7.2. Additional information from India Meteorological Department, Kolkata Airport:

Met Office measures the rainfall at Surface Observatory Compound situated outside the aerodrome operational area which is around 2 KM away from the runway side. Met office further informed that:

1.7.2.1. Amount of rainfall recorded at that observatory from 0000 IST to 2400 IST on 02.7.2019 was 020.1 mm.

1.7.2.2. Amount of rainfall recorded at that observatory between 0902 to 0904 UTC on 02.7.2019 was 01.0 mm.

1.7.2.3. Amount of rainfall recorded at that observatory between 0902 to 0920 UTC on 02.7.2019 was 09.0 mm.

1.7.2.4. Horizontal Visibility at Kolkata Aerodrome on 02.7.2019 at 0900 & 0930 UTC were 3000 M .

1.7.2.5. Intensity of rain at the said observatory compound during the period from 0900 to 0905 UTC was not so high to cause visibility become zero.

1.8. Aids to Navigation:

The aerodrome is equipped with aids like DVOR, DME, ILS CAT-II, and Secondary RADAR for navigation. All facilities were serviceable. Navigational aids onboard the aircraft were also serviceable.

1.9. Communication:

The aircraft was always in two way communication with Kolkata ATC during approach and landing.

1.10. Aerodrome Information:

Kolkata Airport has two parallel runways namely 19L/01R and 19R/01L. Runway 19L was in use. It has following declared distances.

TORA 3627 M,

TODA 3627 M,

ASDA 3627 M,

LDA 3200 M,

Threshold for runway 19 L is displaced by 427 metres (1400 feet). ILS touchdown point runway 19 L is 1066 feet from displaced threshold. Therefore first touchdown zone from beginning of the runway is 2466 feet. Taxiway 'K' intersection is at 982 metres (3222 feet) from the beginning of the runway. The runway surface condition was wet during landing of aircraft.

1.11. Flight Recorder:

The aircraft has a Cockpit Voice Recorder (CVR) and Digital Flight Data Recorder (DFDR). Both were serviceable.

1.11.1. CVR read out revealed that the flight crew were issued positive clearance to land by Tower controller of Kolkata ATC. The flight crew carried out landing check list. After landing the flight crew informed ATC about suspected damage of runway edge lights and requested for inspection of the runway. Air India flight AI-710 was in approach for landing. This flight was instructed by Tower controller of ATC Kolkata to 'Go-Around' due damage of runway edge lights.

1.11.2.DFDR read out revealed the following:

1.11.2.1. At 1000 feet radio altitude, the landing gear and flaps were extended. The aircraft was in landing configuration. Vref was 146 kt. The aircraft corrected air speed (CAS) was 154.5 kt. Vertical speed (sink rate) was -960 feet per minute. The required heading of approach was 186.7°, but the aircraft was maintaining a heading of 179° approx. It indicated that the aircraft was making a crabbed approach.

1.11.2.2. At 300 feet radio altitude, wings were almost level. A roll of 2° or less was observed.

1.11.2.3. At 163 feet radio altitude, the CAS was observed to be increasing to 173 kt. It remained above 166 kt (Vref+20 kt) for 6 seconds. However the ground speed was 160 kt approx. and there was no significant change in ground speed. Extract of 'Heading and Drift Angle' below 50 feet taken from DFDR between time 09:02:46 UTC and 09:03:05 UTC shows the following:

Aircraft in flight/ground (UTC)	Captain's Heading (in degrees)	Drift Angle (in degrees)	Effective Heading (in degrees)	Selected Heading for runway centre line. (in degrees)	Aircraft movement with respect to runway centreline
Flight 09:02:46	184.2	3.25	187.45	186.7	Towards right edge of runway.
Flight 09: 02: 47	183.5	4.04	187.54	186.7	Towards right edge of runway.
Flight 09: 02: 48	183.2	3.96	187.16	186.7	Towards right edge of runway.
Flight 09: 02: 49	183.5	3.69	187.19	186.7	Towards right edge of runway.
Flight 09: 02: 50	183.5	3.78	187.28	186.7	Towards right edge of runway.
Flight 09 :02: 51	183.9	3.96	187.86	186.7	Towards right edge of runway.
Flight 09: 02: 42	185.3	3.25	188.55	186.7	Towards right edge of runway.
Ground 09:02:53	186.7	2.11	188.81	186.7	Towards right edge of runway.
Ground 09:02:54	186.7	3.16	189.86	186.7	Towards right edge of runway.
Ground 09:02:55	184.2	4.13	188.33	186.7	Towards right edge of runway.
Ground 09:02:56	183.9	5.10	189.00	186.7	Towards right edge of runway.
Ground 09:02:57	179.3	8.17	187.47	186.7	Along the right edge shoulder of runway.
Ground 09:02:58	179.6	5.80	185.40	186.7	Towards centre line.
Ground 09:02:59	181.1	3.69	184.79	186.7	Towards centre line.
Ground 09:03:00	181.4	3.08	184.48	186.7	Towards centre line.
Ground 09:03:01	180.4	2.99	183.39	186.7	Towards centre line.
Ground 09:03:02	180.7	2.29	182.99	186.7	Towards centre line.
Ground 09:03:03	181.1	1.85	182.95	186.7	Towards centre line.
Ground 09:03:04	180.7	1.85	182.55	186.7	Towards centre line.
Ground 09:03:05	181.8	0.88	182.68	186.7	Towards centre line.

1.11.2.4. In the above table, it is clear that the pilot was giving continuous input for change of 'heading' before and after landing. At 09:02:46 UTC the aircraft was at 42 feet above the runway centreline and aligned with it. In the given context, an effective heading of 187° approx would keep the aircraft aligned with centreline or parallel to it. An effective heading more than 187° would make the aircraft move or roll towards right edge of the runway; and effective heading less than 187° would cause the aircraft to move or roll from 'right edge of the runway' towards centreline. There was a continuous drift of the aircraft towards right. Between 09:02:46 UTC and 09:02:53 UTC, the 'captains heading' was less than 187° but the aircraft 'effective heading' remained more than 187°. So the aircraft drifted obliquely towards right from the centreline.

1.11.2.5. At 09:02:52 UTC, the RHS landing gear touched first as the aircraft had a 7° right roll. This roll was within limit. The aircraft touched down with all the three landing gears in the next second at 09:02:53 UTC. The CAS was 151.5 kt and ground speed was 146 kt.

1.11.2.6. The aircraft landed with an effective heading of 188.81°; which was a heading that takes the aircraft towards right edge of runway.

1.11.2.7. The pilot applied correction at 09:02:55 UTC, immediately after landing and manoeuvred the aircraft from 'right edge of the runway' to centreline of runway.

1.11.2.8. The spoiler/speed brakes were deployed immediately on touchdown. The thrust reversers were deployed 04 seconds after touchdown.

1.11.2.9. Below 50 feet, wind speed recorded in DFDR at the time of landing varied between 19.5 kt and 17.5 kt at 151.5 ° and 152.5 ° respectively.

1.12. Wreckage & Impact information:

There was no impact and no wreckage in this incident.

1.13. Medical & Pathological information:

The pilot-in-command had undergone pre-flight medical check (BA check) at Delhi at 2330 UTC on 01.07.2019. The alcSENSOR reading was 0.000. The co-pilot also had undergone pre-

flight medical check (BA check) at Delhi at 2336 UTC on 01.07.2019 before operating the flight. The reading of alcosensor was 0.000. Both tested negative for alcohol.

1.14. Fire:

There was no fire.

1.15. Survival Aspects:

The incident was survivable.

1.16. Tests & Research:

Nil.

1.17. Organizational & Management information:

M/s Spicejet Limited has its corporate office at Gurgaon, Haryana. It has a mixed fleet of Boeing 737-700/800/900 & Q-400 aircraft. It operates to domestic as well international destinations.

1.18. Additional information:

1.18.1. Pilot in-Command mentioned in his statement that visibility was 2800 meters and runway was clearly visible at 1000 feet AFE and approach was stable by 1000 feet. So they continued approach. Intensity of rain increased about the time the aircraft began to flare. But the runway was clearly visible all the way until after touchdown. It was a normal landing within the touchdown zone. Speed brakes and thrust reversers were deployed and immediately after that rain became very heavy. The runway, centre line markings and runway edge lights were not visible for a short while. As he had deployed the reversers and realising that going around in that situation could further aggravate the situation, go around was not carried out. After a few seconds when he was able to spot 2 runway edge lights on his right and realising immediately that he had deviated right of centreline, corrective action was taken and aircraft was immediately returned to the runway centreline. There was no unusual noise or vibration but realising that aircraft was in close proximity to the runway edge lights he voluntarily informed the ATC of suspected contact of landing gear with the runway edge lights. It was found out that 5 (five) runway edge lights were damaged. On carrying out the post flight walk

around, right landing gear wheel was found with some cuts. No injury to any cabin crew member or passengers was reported and deplaning was done normally at the parking bay.

1.18.2. The flight crew had operated following flights on 02.07.2019 before the incident flight (SG-275).

SG- 263: Delhi- Kolkata, Chokes OFF- 0034 UTC, chokes ON-0245 UTC.

SG- 274: Kokata- Pune, Chokes OFF- 0327 UTC, chokes ON- 0550 UTC.

1.18.3. The flight crew did not have a history of involvement in any other occurrence.

1.19. Useful or Effective Investigation Techniques:

1.19.1 Advanced Surface Movement Guidance & Control System (ASMGCS) replay was analysed. It was observed that the aircraft touched down near taxiway 'K' and after touchdown it continued to roll towards right edge of runway. Its heading was gradually becoming parallel to the runway centre line and the aircraft rolled on the right outermost edge (shoulder) of the runway. It rolled on the right shoulder of the runway between taxiway 'K' and taxiway 'A'. After crossing taxiway 'A', the aircraft came on centreline of the runway.

1.19.2. DFDR data of the flight was replayed using a software. Replay of DFDR data shows that during approach the aircraft was aligned with the runway centreline till it was 50 feet approx. above the runway. At 50 feet, the aircraft was passing over the displaced threshold. Below 50 feet, it began to drift towards right from the runway centreline and touched down near the 'Aiming Point' marking on the right side of centreline, abeam taxiway 'K'. After touchdown the aircraft rolled obliquely towards runway edge on the right side and rolled on the shoulder of the runway. Thereafter, the aircraft rolled towards centreline and continued its roll further along the centreline.

2. ANALYSIS

2.1. Flight Crew and Aircraft operations:

The flight crew were appropriately qualified. Their FDTL was within limit. The aircraft made approach in crosswind conditions. The wind was blowing from left to right (South East to North West) across the aircraft and its speed was less than 20 kts. The wind speed was within

permissible limit. At 1000 feet radio altitude, the flaps and main landing gears were extended. Aircraft CAS was 154.5 kt which was closer to the Vref speed of 146 kt. Thus the aircraft was stabilized at 1000 feet. At 300 feet radio altitude, a roll of less than 2° was observed. Wings were almost level. At 163 feet radio altitude, the CAS was 173 kt which was higher than Vref+20 kt speed. The CAS remained higher than Vref+20 kt speed for 06 seconds. However the ground speed was 160 kt approx and there was no significant change in ground speed due increase in CAS. Increase in CAS might be attributed to momentary gust. It implies that approach of the aircraft was stable. Captain's heading was less than the selected heading for runway centreline. Therefore the aircraft made a crabbed approach in crosswind conditions. The crosswind component was blowing from left to right of the aircraft. A continuous right drift angle was observed in the DFDR. This continuous drift towards right was attributable to crosswind which was blowing from left to right of the aircraft. The DFDR replay showed that the aircraft was aligned with the centreline of runway 19L till it descended to 50 feet radio altitude and passing over displaced threshold of runway 19L. Below 50 feet radio altitude, the captain's heading was less than 187° but the effective heading (captain's heading + drift angle) of the aircraft was more than 187°. In this context, effective heading more than 187° would cause the aircraft to move obliquely from runway centreline towards right edge of the runway. At the time of touchdown, the pilot gave heading input of 186.7° which was equal to the selected heading for runway centreline. But by that time the aircraft had already drifted from runway centreline towards right and landed near 'Aiming Point' marking on the right hand side. Spoilers/Speed Brakes were deployed immediately on touchdown and thrust reverser was deployed 4 seconds after touchdown. The pilot was giving continuous input for control of heading before landing but the heading input was not sufficient to correct the drift of aircraft towards right. The aircraft touched down with a right roll angle of 7° and its RHS main landing gear touched first. This right roll was within limit. In the next second, all the three landing gear touched down. After landing, the aircraft effective heading was 188.81°. As the effective heading was more than 187°, the aircraft continued to roll towards right edge of the runway. As per DFDR data, the pilot applied 'heading' correction immediately after landing. The aircraft drifted a bit towards right and rolled along right shoulder of the runway. Thus, the aircraft was prevented from going out of right edge of the runway. The aircraft rolled along the runway shoulder for 04 seconds between taxiway 'K' and taxiway 'A' and then it turned towards runway centreline. Five (05) numbers of runway edge lights were damaged by the aircraft between taxiway 'K' and taxiway 'A' during its landing roll on the right shoulder of

the runway. As all cut marks on tyres were confined to main wheel no. 3 and no. 4; it implied that main wheel no. 3 and no. 4 only damaged the runway edge lights.

2.2. Weather:

The runway was wet. It was raining over the airfield. ATC informed the pilots that the wind was 150°/18kt. Wind speed at the time of landing varied between 19.5 kt and 17.5 kt at 151.5° and 152.5° respectively as per DFDR. The wind was South Easterly and blowing from left to right of the aircraft. A continuous right drift angle was observed in the DFDR. This continuous drift towards right was attributable to crosswind which was blowing from left to right of the aircraft. The wind speed was within limits for landing. The pilot-in-command mentioned in his statement that runway, centre line markings and runway edge lights were not visible for a short while after landing due to heavy rain. The aircraft had landed at 0903 UTC. However, information obtained from observatory of India Meteorological Department indicated that the intensity of rain between 0900 UTC and 0905 UTC was not so high to cause zero visibility. Also the horizontal visibility was 3000 metres during the period of touchdown of the aircraft. Therefore, claim of the pilot that runway, centre line markings and runway edge lights were not visible due heavy rain is not correct on the basis of available evidences. The cross wind was blowing from left to right approx. and was causing a rightward drift to the aircraft. Weather was a contributory factor to the incident.

2.3. Maintenance aspects of aircraft:

The 'Tech log entry' by the pilot-in-command carried information on damage caused to RH main landing gear tyres during landing roll by runway edge lights. The aircraft vacated runway after landing and got parked in its allocated bay. Apparently the brakes of the aircraft were working fine. There was no post flight snag on the aircraft related to any systemic failure in the sector Pune-Kolkata. Vertical acceleration (g value) was 1.5g during landing as entered in 'Tech log'. Heavy landing checks were carried out and no damage was found. Main wheel assembly 1, 2, 3& 4 were replaced. Brake assembly of no. 2 wheel was also replaced. The above maintenance actions were post landing activities. Maintenance aspect is not a contributory factor to the incident.

2.4. Circumstances leading to the incident.

Upto 50 feet radio altitude the aircraft was aligned with the centreline of the runway 19L. There were continuous right drift angle values recorded in DFDR due to wind. Below 50 feet radio altitude, the aircraft was found drifting towards right from the centreline due to wind from left to right. The effective heading (captain's heading + drift angle) was continuously higher than 187°. At heading values higher than 187°, the aircraft continuously drifted from runway centreline towards right. 'Heading correction' applied by pilot below 50 feet till landing was not sufficient to counter the right drift and keep the aircraft heading along runway centreline. As a result, the aircraft drifted from runway centreline towards right and landed on runway near 'Aiming Point' marking on the right hand side. The right hand side 'Aiming point' marking is close to the right edge of the runway. The aircraft landed with an effective heading of 188.81° and rolled obliquely towards the right edge of runway 19L. After landing, heading correction was applied immediately. But as the aircraft landed on the right hand side of the centre line near 'Aiming Point' marking and its heading was more than 187°, it drifted further right and rolled along runway shoulder between taxiway 'K' and taxiway 'A'. During this landing roll on the right shoulder of the runway, five (05) numbers of runway edge lights were damaged. The flight crew applied further correction in heading of the aircraft during its landing roll along right shoulder of the runway and steered the aircraft from right shoulder of the runway to the centreline.

3. CONCLUSION:

3.1 Findings:

3.1.1. The flight crew were appropriately licensed and qualified to operate the flight.

3.1.2. During approach, it was raining over the airfield and runway was wet. There was a continuous South –Easterly wind that blew from left to right of the aircraft. Wind speed varied between 19.5 kt and 17.5 kt at the time of landing. The wind speed was within operational limit. The wind was causing the aircraft to drift rightward. Weather was a contributory factor to the incident.

3.1.3 The aircraft was aligned with centreline of runway 19L till its descent to 50 feet radio altitude over runway threshold.

3.1.4. Below 50 feet radio altitude while the aircraft was flaring, it drifted towards right from the runway centreline due crosswind.

3.1.5. During flare, the flight crew did not apply sufficient correction to counter the right drift and keep the aircraft heading aligned with the runway centreline till touchdown. The aircraft continued to drift towards right.

3.1.6. The aircraft touched down on runway near 'Aiming Point' marking on the right hand side abeam taxiway 'K' which is close to the right edge of the runway.

3.1.7. The aircraft landed with an effective heading of 188.81°. At this heading, the aircraft rolled obliquely towards right edge of the runway.

3.1.8. Correction of aircraft heading was applied immediately after landing, but as the aircraft landed near 'Aiming Point' marking on the right hand side, it was closer to the right edge of the runway and it drifted further and reached on the right shoulder of the runway very soon.

3.1.9. Correction applied for aircraft heading immediately after landing prevented the aircraft from going out of the runway.

3.1.10. Five (05) runway edge lights were damaged by no.3 and no.4 main wheel (RH main wheel) during landing roll of the aircraft along right shoulder of the runway 19L between taxiway 'K' and taxiway 'A'.

3.1.11. Maintenance aspect of the aircraft was not a contributory factor to the incident.

3.1.12. Statement of the pilot-in-command that runway centre line markings and runway edge lights were not visible due heavy rain is not correct. As per IMD report, rain was never so much to cause visibility to be zero. Visibility at the time of landing was 3000 meters.

3.1.13. The flight crew encountered cross wind from left to right during flare of the aircraft below 50 feet. The flight crew did not apply sufficient correction to maintain aircraft heading along runway centreline and as a result the aircraft drifted towards right and landed on runway near 'Aiming point' marking on the right hand side abeam taxiway 'K'. It then drifted further towards right edge of the runway and damaged five edge lights.

3.2 Probable cause of the incident:

The flight crew encountered cross wind during flare and did not maintain aircraft heading along the runway centreline. As a result the aircraft drifted from the runway centreline and landed at the aiming point towards the right side on the runway. After landing, the aircraft further drifted towards the right edge of the runway and damaged runway edge lights.

Weather was a contributory factor to the incident.

4. SAFETY RECOMMENDATIONS:

4.1. Action as deem fit may be taken by the DGCA in view of the findings and the cause.



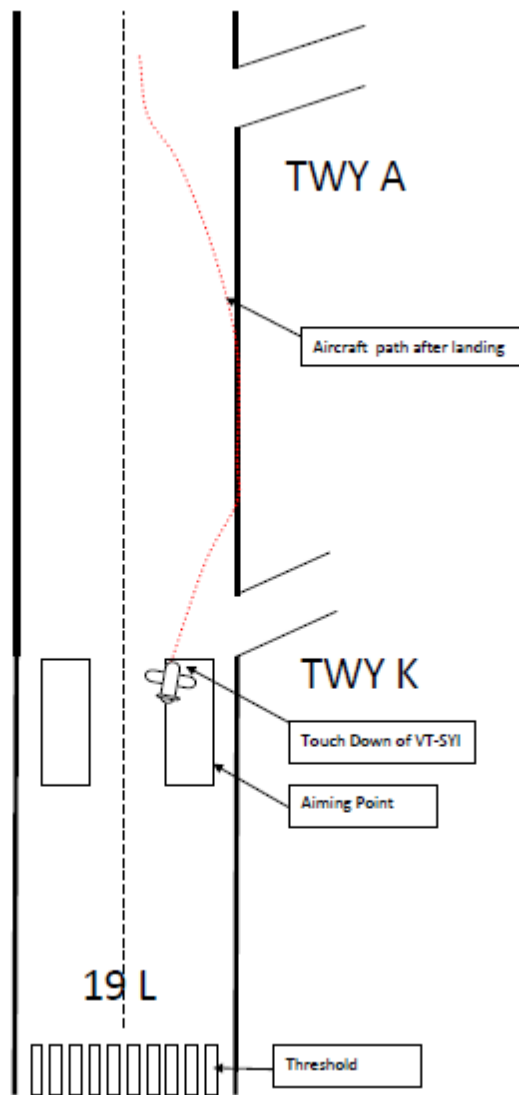
(H.N. Mishra)

Deputy Director of Air Safety

O/o Dy. DGCA (ER)

Place :Kolkata

Date :24.06.2021



Schematic Diagram of the touchdown and landing roll of the aircraft VT-SYI.



Deviated path of aircraft VT-SYI after touchdown on runway 19L of Kolkata
(Deviation from centreline shown by yellow dashes).

Appendix-B

(Photographs of damaged runway edge lights)







