



**GOVERNMENT OF INDIA
MINISTRY OF CIVIL AVIATION**

**FINAL INVESTIGATION REPORT ON SERIOUS
INCIDENT TO SPICEJET B737 AIRCRAFT VT-SGU
AT DELHI ON 05.01.2014**

**AIRCRAFT ACCIDENT INVESTIGATION BUREAU
SAFDARJUNG AIRPORT
NEW DELHI – 110003**

FOREWORD

This document has been prepared based upon the evidences collected during the investigation; discussions held with the post holders and involved personnel; replay of recorders and opinion obtained from the experts.

The investigation has been carried out in accordance with Annex 13 to the convention on International Civil Aviation and under Rule 11 of the 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 incidents.

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1.0 FACTUAL INFORMATION

1.1 HISTORY OF FLIGHT

On 05th Jan 2014, B737 aircraft VT-SGU was scheduled to operate flight SG-255/256 (Delhi-Goa-Delhi). The flight (both the sectors) was under the command of an ATPL holder who is a CAT II qualified pilot. His first officer who was a CPL holder was CAT IIIA qualified. The aircraft was certified for CAT IIIA operations. The aircraft had earlier departed Delhi in the afternoon and reached Goa at 1205 UTC. At Goa the flight crew was provided with computerized flight plan (CFP), latest weather information and other documents required for operation of flight. As per the CFP the schedule time of departure (STD) from Goa was 1220 UTC with expected arrival at Delhi as 1445 UTC. The latest Terminal Area Forecast (TAF) was also provided to the pilot in command at Goa. The forecasted visibility at the destination airport i.e. Delhi between 1000 UTC to 1800 UTC was 400 m though becoming 200 m between 1500 UTC to 1600 UTC. The forecasted visibility at the alternate aerodromes i.e. Lucknow and Jaipur was 2000 m.

At the time of take-off from Goa, 9.5 tonnes of fuel was on board as per the CFP which included 500 kgs of fuel for holding at destination. The aircraft actual time of departure from Goa was 1230 UTC.

As per the PIC, when the aircraft was at 50 NM from Delhi they had about 700 kg of extra fuel. The ATC instructed the aircraft to reduce speed to 210 Kts. Due to heavy traffic and low visibility conditions a large number of aircraft were in sequence for landing and SG256 was 13th in sequence. When the aircraft was approaching Delhi, on Standard Terminal Arrival Route (STAR), it was asked to do two orbits. Subsequently, they were made to descent to 7000 ft. At this point of time, the fuel was 3.4T.

When the aircraft was approaching Delhi, as per the ATIS broadcast the visibility was 150 meters and RVR for runway 28 was 1150 m/ 950 m/ 550m. Later there was fluctuation reported in the RVR and when the aircraft was being vectored for runway 28 the roll out RVR for runway 28 had dropped to 50 m. The PIC decided to hold at 7000 ft, expecting that there will be an

improvement in roll out RVR. The aircraft was in hold for about 26 minutes and the fuel quantity during this time was approaching minimum diversion fuel (MDF). The PIC checked Jaipur weather. The visibility reported was 900 m reducing to 800 m with RVR of 1500 m.

The roll out RVR for runway 28 at Delhi did not improve and RVR for runway 29 was already below minima. The PIC therefore decided to divert to Jaipur. The fuel onboard at that instant was 3100 kgs and the required minimum diversion fuel to Jaipur was 2573 kgs. At that particular moment large number of aircraft was deciding on diversion for the same reason. There was frequency congestion as number of aircraft was trying to contact Jaipur ATC. After setting course for Jaipur the aircraft started preparing for approach in to Jaipur.

The flight crew assessed their fuel quantity for going to Ahmedabad or Lucknow. As per the PIC, there was no alternate but to land at Jaipur. When the aircraft was descending into Jaipur, the ATC Jaipur had informed the aircraft that the visibility had dropped to 50 m with an RVR of 200 m for runway 27. PIC however informed ATC about their commitment to land at Jaipur due fuel. The flight crew decided to carry out dual channel auto land.

There were two aircraft ahead of the Spice Jet aircraft, one out of these had carried out go around and diverted to Ahmedabad. Another aircraft (AI) carried out manual landing in below minima conditions. While landing this aircraft (AI) met with an accident and due to the severe damage could not be moved resulting in blocking of the runway. The ATC Jaipur conveyed this information to the PIC of SG-256 and at that time the aircraft was at 5 nm from touchdown. Once the flight crew of Air India flight also repeated that the runway was blocked, a missed approach was initiated by SG-256 at 3000 ft. Total fuel on board at that time was 1715 kgs.

As per the PIC, he exercised his emergency authority and decided to return to Delhi irrespective of reported visibility / RVR. After diverting to Delhi, the aircraft came in contact with ATC Delhi, declared MAYDAY due fuel with a request for straight and short vector for ILS 28. During ILS approach for runway 28, the tower had reported RVR for runway 28 as 375 m/900m/50m. A

dual channel auto land was carried out. The fuel onboard at the time of touchdown was 400 kgs.

There was no damage to the aircraft or injury to any person. MAYDAY was cancelled and the aircraft vacated the runway via taxiway D1. As a precaution follow me vehicle guided the aircraft to the bay. The incident occurred in poor visibility conditions.

1.2 INJURIES TO PERSONS

INJURIES	CREW	PASSENGERS	OTHERS
FATAL	Nil	Nil	Nil
SERIOUS	Nil	Nil	NIL
MINOR/NONE	06	176	----

1.3 DAMAGE TO AIRCRAFT

None. The aircraft carried out a safe emergency landing after declaring MAY DAY due fuel.

1.4 OTHER DAMAGE

Nil

1.5 PERSONNEL INFORMATION

	PIC	FO
Licence type	ATPL	CPL
Total experience	6410 hrs.	1996 hrs.
PIC experience	4512 hrs.	Nil on B-737
PIC experience on type	2003 hrs.	Nil (1743 hrs. as FO)

1.6 AIRCRAFT INFORMATION

The aircraft was manufactured by M/s Boeing Airplane Company, Seattle USA in May 2011. It is an Indian registered aircraft bearing MSN 37366(8GJ) and Line no 3628. The aircraft had valid C of R & C of A as on date of the incident. The scrutiny of the Airframe Log book revealed that as on 5th January 2014 the aircraft had completed 9714:29 Hrs (TSN) and 6512 landings (CSN).

The aircraft was powered with two CFMI Engines. The details of the Engines are given below:

	Engine # 1	Engine # 2
Engine Model	CFM56-7B24	CFM56-7B24
Serial number	893881	805875
Time Since New (Hrs)	26224:26	9714:29
Cycles Since New	16055	6512

No maintenance action was pending either on the aircraft or on engines as on the date of incident. The aircraft landed at Delhi after declaring May Day due fuel. Owing to low fuel message on tank # 1 and #2 following maintenance actions were carried out:

"Both main tank fuel boost pump priming was carried out by uplifting 2000 kg in each tank. LOW message disappeared. Fuel pump functional check carried out as per AMM 28-22-41. Found satisfactory. There were nil reported defects however as a precautionary measure all case drain filters inspected for metal particles, no metal particles observed. SYS A EDP and EMDP case drain filter replaced as per AMM 29-11-41/ 29-11-51. SYS B EDP and EMDP case drain filter replaced. Post installation check carried out found satisfactory".

1.7 METEOROLOGICAL INFORMATION

The relevant METAR information for the destination (Delhi) & the two alternates i.e. Jaipur & Lucknow are as follows:

TIME	RELEVANT METARS FOR DELHI (5 th Jan. 2014)
0000Z	0503/0512 00000KT 0100 FG VV/// BECMG 0504/0505 0500 MIFG BECMG 0506/0508 1500 FU/BR NSC TAF
0500Z	0000Kt 0100 R28/0700 R29/0450 Fg VV/// 13/11 Q1017 BECMG 0150=
0900Z	0512/0521 27005KT 0400 FG NSC BECMG 0515/0516 VRB02KT 0200 FG VV/// BECMG 0518/0519 0050 FG TAF
1130Z	27005KT 0250 R28/0850 R29/0500 FG NSC 15/15 Q1012NOSIG=
1200Z	25004KT 0250 R28/0750 R29/0500 FG NSC 14/14 Q1012NOSIG=
1230Z	26004KT 0200 R28/1000 R29/0700 FG VV/// 13/13 Q1013 NOSIG=
1300Z	27003KT 0150 R28/0900 R29/0600 FG VV/// 13/13 Q1013 NOSIG=
1330Z	26003KT 0150 R28/1150 R29/0500 FG VV/// 12/12 Q1013 NOSIG=
1400Z	VRB02KT 0100 R28/0850 R29/0375 FG VV/// 12/12 Q1013 NOSIG=
1430Z	00000KT 0050 R28/0800 R29/0200 FG VV/// 11/11Q1013 NOSIG=
1530Z	00000KT 0000 R28/0450 R10/0050 R29/0000 R11/0050FG VV/// 09/09 Q1014 NOSIG=
1600Z	00000KT R28/0450 R29/0000 R10/0040 R11/0000 FG VV/// 08/08 Q1014 NOSIG=
1630Z	00000KT R28/0400 R28M/0800 R29/0000 R10/0040R11/0000 FG VV/// 08/08 Q1014 NOSIG=
1700Z	26003KT 0000 R28/0050 R28M/0050 R10/0050 R29/0000 R11/0000 FG VV/// 08/08 Q1014 NOSIG=
1730Z	23003KT 0000 R28/0050 R28M/0050 R10/0050 R29/0000 R11/0000 FG VV/// 08/08 Q1014 NOSIG=

TIME	RELEVANT TAFs FOR JAIPUR (UTC) (4th Jan. 2014)
1800	0421/0506 VRB02KT 1200 BR FEW035 BECMG 0423/0501 00000KT 0800 MIFG BECMG 0504/0505 09005KT 1500 BR=TAF
2100	VIJP 042100Z 0500/0509 00000KT 0800 MIFG NSC BECMG 0504/0505 02005KT 1500 BR BECMG 0506/0508 3000 HZ=TAF

TIME	RELEVANT METARS FOR JAIPUR (UTC) (5th Jan. 2014)
0000	00000KT 0800 MIFG SCT035 BECMG 0504/0505 09004KT 1500 BR BECMG 0507/0509 3000 HZ= TAF
0020	00000KT 0050 R27/0450V2000D FG 13/13 Q1014 NOSIG= SPECI
0032	00000KT 0050 R27/0250D FG 13/13 Q1014 NOSIG= SPECI
0430	26004KT 0100 R27/0175N FG VV/// 12/12 Q1018 BECMG0350= SPECI
0430	26004KT 0100 R27/0175N FG VV/// 12/12 Q1018 BECMG 0350= SPECI
0500	0000KT 0150 R27/0275N FG VV/// 13/13 Q1018 BECMG0350 m =
0500	0503/0512 00000KT 0800 MIFG SCT035 BECMG 0504/0505 09004KT 1500 BR BECMG 0507/0509 3000 HZ= TAF
0530	VRB02KT 0350 R27/0500N FG VV/// 13/13 Q1017 BECMG 0600= SPECI
0551	VRB03KT 0600 R27/0800N MIFG VV/// 13/13 Q1017 BECMG 0800= SPECI
0551	VRB03KT 0600 R27/0800N MIFG VV/// 13/13 Q1017BECMG 0800= SPECI
0630	VRB01KT 0900 R27/1100N MIFG VV/// 14/14 Q1016BECMG 1500= SPECI

0630	VRB01KT 0900 R27/1100N MIFG VV/// 14/14 Q1016 BECMG 1500= SPECI
0730	27004KT 1600 R27/1900U BR SCT035 BKN100 16/14Q1015 NOSIG= SPECI
0900	VRB02KT 2000 BR FEW035= TAF
1130	20004KT 3000 HZ NSC 18/13 Q1013 NOSIG= SPECI
1230	18004KT 2000 FU NSC 16/14 Q1013 NOSIG=
1330	VRB01KT 1500 R27/P2000N BR NSC 14/14 Q1014 NOSIG=
1330	VRB01KT 1500 R27/P2000N BR NSC 14/14 Q1014 NOSIG= SPECI
1430	VRB00KT 0900 R27/1500D MIFG NSC 13/13 Q1014 BECMG 0800=
1500	VRB01KT 0900 R27/1300D MIFG NSC 13/13 Q1014 BECMG 0800=
1517	VRB03KT 0400 R27/1000D FG VV/// 13/13 Q1014 BECMG0350= SPECI
1526	00000KT 0050 R27/0200V1100D FG VV/// 13/13 Q1015NOSIG= SPECI
1630	00000KT 0000 R27/0150 FG NSC 13/13 Q1015 NOSIG=
1730	00000KT 0000 R27/0125 FG NSC 12/12 Q1015 NOSIG=
1800	0521/0606 VRB02KT 0050 FG NSC BECMG 0604/0605 0800 MIFG= TAF

Jaipur, as an airfield, does not report weather trends. However, post accident, when the Committee of Inquiry visited Jaipur Met Office, it was given to understand that trends are being issued post 05th January, 2014.

TIME	RELEVANT METARS FOR LUCKNOW (UTC) (5 th Jan. 2014)
0000	VRB02KT 0400 FG FEW020 SCT100 BECMG 0504/0506 29006KT 1200 BR/HZ BECMG 0507/0509 3000 HZ= TAF
0030	28006KT 0600 R27/1200 FG VV/// 13/12 Q1014 BECMG 0800 MIFG= SPECI
0430	VRB01KT 0800 R27/0900 MIFG FEW100 15/13 Q1016 NOSIG= SPECI
0500	VRB02KT 1000 R27/1200 MIFG FEW020 SCT 100 16/12 Q1016 BECMG 1500=
0530	VRB02KT 1800 R27/P2000 BR FEW020 SCT10017/13 Q1015 NOSIG= SPECI
0730	32003KT 3500 HZ FEW100 21/11 Q1013 NOSIG= SPECI
0900	VRB02KT 2000 HZ/FU FEW100 BECMG 0516/0518 1000 BR BECMG 0519/0521 0800 BR/MIFG= TAF
1130	29005KT 3000 HZ NSC 20/14 Q1011 NOSIG= SPECI
1200	27004KT 2500 HZ NSC 20/13 Q1011 NOSIG=
1230	26003KT 2500 HZ NSC 19/13 Q1011 NOSIG=
1300	27004KT 2000 HZ NSC 18/13 Q1012=
1330	26003KT 2000 HZ NSC 17/13 Q1012 NOSIG=
1400	25003KT 2000 HZ NSC 17/14 Q1012 NOSIG=
1430	26004KT 2000 HZ NSC 16/14 Q1013 BECMG 1500=
1500	29003KT 2000 BR NSC 16/13 Q1012 NOSIG=
1530	27003KT 2000 BR NSC 15/13 Q1013 NOSIG=
1630	27003KT 1500 R27/P2000 BR NSC 15/13 Q1013= SPECI
1715	VRB02KT 0500 R27/1400 FG NSC 14/13 Q1013= SPECI
1730	VRB02KT 0500 R27/1400 FG NSC 14/12 Q1013=

1.8 AIDS TO NAVIGATION

	DELHI	JAIPUR	LUCKNOW
NAV AIDS AVAILABLE	VOR DME	VOR DME	VOR DME
	CAT I/II/III (A & B) ILS	CAT I ILS	CAT II ILS
	APPROACH RADAR SERVICES	---	---

There were no known navigational aid difficulties reported by the crew.

1.9 COMMUNICATIONS

There was two-way communication between the aircraft and ATC. Neither the flight crew nor the ATC officers have encountered any difficulty in communication.

1.10 AERODROME INFORMATION

Indira Gandhi International Airport (IATA code: DEL, ICAO code: VIDP) is operated by Delhi International airport private limited (DIAL).The ATC is controlled by Airports Authority of India (AAI).

Delhi Airport has three runways. The details are as follows:

Runway	Dimension (in meters)	Landing Category (ILS)
11/29	4430 X 60	ILS CAT III B (both side)
10/28	3810X 45	RWY 28-ILS CAT III B RWY 10-ILS CAT I
09/27	2813 X 45	ILS CAT I (both side)

Alternate aerodrome information:

Aerodrome	Runway	Dimension (in meters)	Landing Category (ILS)
Jaipur	09 / 27	2797 X 45	ILS CAT I (RWY27)
Lucknow	09 / 27	2742 X 45	ILS CAT II (RWY27)

1.11 FLIGHT RECORDERS

Both the SSFDR & SSCVR were replaced after the incident. The relevant portion of the readouts is discussed in the analysis portion. L3 Communication SSCVR installed on the aircraft had recording of last 2 hours of operation i.e. from the time the aircraft was at 7000 ft and was cleared for 2600 ft.

1.12 WRECKAGE AND IMPACT INFORMATION

Nil

1.13 MEDICAL AND PATHOLOGICAL INFORMATION

The full set of crew had undergone pre-flight medical prior to departure from Delhi in the morning. The medical report was satisfactory and BA test report was negative.

1.14 FIRE

There was no fire

1.15 SURVIVAL ASPECTS

The incident was survivable.

1.16 TESTS AND RESEARCH

Nil

1.17 ORGANIZATIONAL AND MANAGEMENT INFORMATION

1.17.1 SPICEJET

The operator has got a scheduled operators permit from DGCA and was valid on the date of occurrence with the aircraft endorsed on the SOP permit. The aircraft maintenance is carried out under CAR 145 issued by DGCA.

The operator has published 'Fog Plan' for the year 2013-2014. As per the fog plan, all flights landing in to Delhi up to 0930 hrs IST and after 2000

hrs IST are required to be operated by CAT IIIA qualified operating crew and CAT IIIA certified aircraft.

1.17.2 INDIAN METEOROLOGICAL DEPARTMENT (IMD)

IMD provides meteorological services to the civil aviation sector in fulfilment of the requirements prescribed by ICAO & instructions given by DGCA. These are provided through Aerodrome meteorological offices and aeronautical meteorological stations. The guidelines for meteorological service to aviation in India are given in “Manual on procedures for meteorological services for aviation in India” which is essentially ICAO Annex 3 with incorporation of national practices. The installation and maintenance of airport meteorological instruments are done by the surface meteorological division at Pune.

Route Forecast, aerodrome forecast, local forecasts and trend forecasts are issued by Aerodrome Meteorological Office (Office having forecasting facilities). During the closed hours of watch of the offices with restricted forecasting hours, the necessary forecasts are issued by the meteorological offices at state/regional centers.

In all Aerodrome Meteorological Office which are having forecasting facility, briefing is available to the pilots and /or flight operations personnel about the prevailing and anticipated weather conditions. Latest surface and upper-air synoptic charts, meteorological reports and forecasts of destination and its alternate(s), SIGMET information, AIREP, prognostic charts and ground based weather radar information should normally be displayed in meteorological Offices and made available for briefing & consultation.

In flight services provided are:

- Significant Meteorological (SIGMET) Information pertaining to the FIRs are issued by the Meteorological Watch Office (MWO) at Chennai, Delhi, Kolkata & Mumbai. These are supplied to the ATS units at the Flight Information Centre (FIC) and Area Control Centre (ACC) for transmission to aircraft in flight.

- Current Weather Reports, Aerodrome Forecasts and SIGMETs of certain stations are broadcast on HF from Kolkata and Mumbai at half hourly intervals. (VOLMET BROADCAST)
- Latest Weather Report of the airport, together with trend forecast valid for the next 2 hours, is included in the Automatic Terminal Information Service (ATIS) broadcast from Chennai, Delhi, Kolkata & Mumbai.

1.18 ADDITIONAL INFORMATION

VISIBILITY REQUIREMENT OF THE ALTERNATE AERODROME

CAR Section 8 Series C part I Issue I, Rev 4 dated 10th December 2013 stipulates the visibility requirements of the alternate airport before dispatch of the flight. The extract is as below:

Table 9: Alternate (Destination and Enroute) Aerodrome Operating Minima for Dispatch

Approach facility configuration	Ceiling DA/H or MDA/H	RVR
For airports supporting one approach and landing Operation.	Authorized DA/H or DA/H plus an increment of 400 ft	Authorized visibility plus an increment of 1500 m
For airports supporting at least two approach and landing operations, each providing a straight-in approach and landing operation to different, suitable runways.	Authorized DA/H or MDA/H plus an increment of 200 ft.	Authorized visibility plus an increment of 800 m.
For airports with a published Cat II or Cat III approach and landing operation, and at least two approach and landing operations, each providing a straight-in approach and landing operation to different, suitable runways.	Cat II procedures, a ceiling of at least 300 ft, or for Cat III procedures, a ceiling of at least 200 ft.	Cat II, a visibility of at least RVR 1200 m or, for Cat III, a visibility of at least RVR 550 m.

Further, Annexure 2 point 3 of CAR Section 8 Series C part I Issue I,

Rev 4 dated 10th December 2013 require that .

"Touch-down zone RVR needs to be reported for Cat I operations, touch-down and mid zone RVR for Cat II operations, touch-down, mid and roll-out zone RVR for Cat III operations. In all cases, touch-down zone will always be controlling, however if any other RVR is reported and is relevant (operator shall not define relevant depending on runway length/aircraft stopping distance unless approved by FSD, DGCA) it also becomes controlling."

The following table may be used for reference.

Type of operation	RVR		
	Touch-down zone	Mid zone	Roll-out zone
CAT I	550 m	125m (without rollout guidance) 75/50m (with rollout guidance)	125m (without rollout guidance) 75/50m (with rollout guidance)
CAT II	300 m	125m (without rollout guidance) 75/50m (with rollout guidance)	125m (without rollout guidance) 75/50 m (with rollout guidance)
CAT IIIA	175 m	125m (without rollout guidance) 75/50m (with rollout guidance)	125m (without rollout guidance) 75/50m (with rollout guidance)
CAT IIIB	75 /50 m	75/50m	75/50m

Note: The use of minimum RVR of 75m or 50m depends on value approved for aeroplanes with roll-out guidance system. The values in bold font are required for the type of operation.

1.19 USEFUL OR EFFECTIVE INVESTIGATION TECHNIQUES

Nil

2.0 ANALYSIS

2.1 Airworthiness & Serviceability of aircraft

Certificate of Registration, Certificate of Airworthiness, Aero Mobile Licence & Certificate of Release to Service in respect of the aircraft were valid. The aircraft and its Engines were being maintained as per the approved maintenance program consisting of calendar period/ flying Hours. The Noise Certificate for the aircraft was current. The Centre of Gravity (CG) of the aircraft was within limit.

Airworthiness Directive, Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engine has been complied with. No snag was pending for rectification before the incident flight nor was any repetitive defect entered in the logbook of the aircraft. Flight crew has not discussed any malfunction of any of the systems during flight nor has entered any operational snag after the flight.

The aircraft landed at Delhi after declaring May Day due fuel. Owing to low fuel message on tank # 1 and #2, both main tank fuel boost pump priming was carried out by uplifting 2000 kg in each tank. LOW message disappeared. No defects were reported. All case drain filters inspected for metal particles and no metal particles observed.

Aircraft or its serviceability has not contributed to the incident.

2.2 Flight crew

Both the flight crew was having valid flying licences with appropriate endorsements of aircraft. They possessed all the necessary documents as required by the regulations. Their Medical check was valid and without any conditions.

The pilot in command was CAT II qualified and the First Officer was CAT III A qualified. The crew qualification or their professional competence has not contributed to the incident but were not in line with the requirements of the Spicejet Fog Plan of 2013-14 for operating the subject flight.

2.3 SSFDR & SSCVR readout analysis:

2.3.1 SSFDR data analysis vis-a-vis Fuel position

TIME (UTC) (HH:MM:SS)	Position of the aircraft	Total Fuel (Kg)	Remarks
12:33:13	Chocks Off/Both Engines On at GOI	9566	Nil
12:37:17	Takeoff from GOI	9485	Nil
14:38:01	Start Of Hold at DEL	3928	Hold altitude - 7000 ft
15:04:41	Diversion To JAI	3107	Aircraft cruising altitude FL 130
15:39:53	Diversion back To DEL	1715	Aircraft cruising FL 140
16:13:16	Landing at DEL	400	Nil
16:31:57	Chocks On/ Both Engines Off at DEL	150	Nil

2.3.2 CVR data analysis:

- At the time when the aircraft was at 7000ft and was cleared for 2600ft by ATC Delhi, the reported RVR for runway 28 was 900m/ 50m/ 50m and for runway 29 was 225m / 125m / 325m.
- Expecting improvement in RVR, the PIC decided to hold at 7000ft.
- The PIC checked for JAI weather which was reported as 900m RVR RWY27 1500, MIFG 800m.
- When the RVR of DEL RWY28 was reported to be 750m/400m/50m, PIC decided to divert to JAI.
- While descending into JAI, ATC informed that the visibility at JAI had dropped to 50 meters and RVR 200 meters for RWY 27. Owing to fuel

status, no other suitable alternate was available to proceed to. Hence the PIC was committed to land at JAI.

- Air India aircraft which was ahead of SG-256 landed on RWY 27 at JAI and declared MAY DAY. ATC conveyed that RWY was blocked, as such SG-256 initiated a missed approach.
- ATC conveyed that RWY 27 is closed for the day. Thereafter PIC decided to return to DEL as fuel was just sufficient for landing at DEL.
- When in contact with DEL ATC, the PIC declared "MAY DAY" owing to low on fuel. He was cleared by ATC to carry out emergency landing.
- The aircraft was vectored for ILS 28. On ILS approach for RWY 28, tower reported RVR was 375m/900m/50m. Subsequently an auto land was carried out at DEL RWY 28 and vacated via D1.

2.4 Fog plan & weather

As per Spicejet 'Fog Plan' for the year 2013-2014, all flights landing in to Delhi after 2000 hrs IST should be operated by CAT IIIA qualified pilot in command. The aircraft departed from DEL at 0920 UTC for the sectors Delhi-Goa-Delhi with CAT II qualified pilot in command and CAT IIIA qualified first officer though with full knowledge that the STA in Delhi on the return sector was 14:45 UTC. The aircraft was CAT IIIA compliant, however due to crew compliment, the flight was restricted to CAT II compliant.

On its first leg aircraft reached Goa at 1205 UTC. For its return leg, as per latest TAF available forecasted visibility at Delhi was becoming 200 meters between 1500 UTC to 1600 UTC, which was below minima though visibility at the alternate airports at the estimated time of arrival was 2000 meters. The PIC has uplifted 300 kgs. of extra fuel (in addition to 500 kgs. as per CFP for hold over Delhi).

CAR Section 8 Series C part I Issue I, Rev 4 dated 10th December 2013 stipulates the visibility requirements of the alternate airport before dispatch of the flight. Considering those requirements, the visibility required for JAI and LKO for CAT I & CAT II operations was 1350 meters (authorized visibility of 550 meters plus an increment of 800 meters) and 1200 meters (Cat II, a visibility of at least RVR 1200 m) respectively.

Though when the aircraft was on approach to Delhi, visibility was 150 meters with RVR for runway 28 as 1150m/ 950m/ 550m but there was fluctuation reported in the RVR and finally when aircraft was being vectored for RWY 28, the roll out RVR for RWY 28 dropped to 50 meters which was below minima. The RVR required as per the Crew qualification was 300m/125m/125m (CAT II). Expecting an improvement in roll out RVR the PIC decided to hold at 7000 ft.

As per the DFDR data the aircraft was in hold for 26 minutes. Approaching MDF the PIC checked Jaipur weather. The visibility reported at Jaipur was 900 meters, reducing to 800 meters and RVR 1500 meters. The PIC did not update himself with Lucknow weather though he had met forecast for Lucknow which was also within minima. The PIC was not aware of any flight following nor he was given any advise at any stage by the flight dispatch.

As the roll out RVR for runway 28 at Delhi did not improve and RVR runway 29 was also below minima, the PIC diverted to Jaipur. At that time the fuel onboard was 3100 Kgs which was also sufficient for diverting to Lucknow and the required minimum diversion fuel to Jaipur was 2573 Kgs. While descending into Jaipur, ATC Jaipur had informed that the visibility had dropped to 50 meters and RVR 200 meters for Runway 27.

The above visibility/ RVR conditions though were below minima but, the PIC was committed to land due fuel. AI aircraft which was ahead of SG-256 had landed at runway 27 at Jaipur and had blocked the only runway available at Jaipur. This was conveyed by ATC to the PIC of the SG-256. Blockage of runway was also intimated to SG256 by flight crew of AI. At this stage the aircraft was at 5NM from touchdown. A missed approach was initiated at 3000 ft with total 1715 Kgs fuel onboard.

The PIC thereafter exercised his authority and decided to return to Delhi. With 1200 Kgs of fuel remaining, the PIC decided to carry out an auto land and declared MAY DAY due low on fuel. The aircraft was vectored for ILS approach runway 28 and at that time the tower reported RVR of 375m/900m/50m. A safe auto landing was carried out at Delhi.

2.5 Issues with IMD

- There was no correlation between the Jaipur TAF of 4th & 5th of January 2014 & METAR issued thereafter.
- Jaipur RVR equipment was not calibrated and no NOTAM was issued in this regard.
- Jaipur ILS “Critical Area” is not protected nor any signage to this affect existed at the airfield at the time of the visit of the committee.
- Jaipur did not issue weather “Trends” along with the METAR. (It was informed that from the following day “Trend” report was being issued).

2.6 Why most of the aircraft diverted to Jaipur

30-40 percent of the cost in running an airline is fuel, hence in the recent times there has been a lot of stress on “Fuel Saving”. Airlines adopt various measures like Decelerated approaches, use of idle reverse after landing, closer alternates etc to save fuel. As the numbers of diversion in day to day operations are few, analysis of diversions does not take place.

In view of the unprecedented incident wherein the aircraft had followed all the requirements laid down but still had gone into a very unsafe condition, which though ultimately had not resulted into any accident, the matter of planning and diversion to alternate airports requires thorough review. The sharing of data across the airlines on this particular aspect is missing. It appears that had there been a better analysis of the earlier diversion and/or fuel emergency cases, there would have been a great opportunity for addressing such issues.

For most flights with destination as Delhi, operators tend to file 1st alternate as Jaipur & 2nd alternate as Lucknow, 1st being Jaipur due to commercial reasons. Flight following is not prevalent in most organizations. There is no weather “Trend” monitoring to advise the flight crew of the expected weather and suggested change in routing or alternate. Airlines dispatch aircraft only for the first sector for a multi-sector pattern, thereafter it is left to the individual set of flight crew to make decisions as per their wisdom based on the METAR which is provided to them.

In the present case also, although the operator confirms to all the requirements laid down by the DGCA office, the internal oversight of flight operations appears to be weak. Had the following been (even few) followed the dangerous situation would not have arisen.

- Proper (safer) planning of the alternate including Last Minute Changes.
- Trend monitoring and In-flight updating of weather followed by appropriate diversions.
- Flight Dispatcher assisting the flight crew over VHF/HF/ ACARS with the latest destination & alternate weather to assist them in making a decision.
- Operations controller providing assistance over VHF/HF/ ACARS to flight crew to make a safer decision. Operations Control as a concept if exercised in true sense can prevent serious events. Operators must have qualified flight crew for conducting operations control.

2.7 Circumstances leading to the incident

Alternates of Jaipur & Lucknow were filed keeping the “Alternate Planning Minima” as mentioned in CAR Section 8, Series C Part 1, Issue 1, (Rev4).

The flight had departed Goa for Delhi with 500 kgs of “Holding Fuel” over the destination (Delhi) and in addition 300 kgs of fuel was uplifted by the PIC. Therefore the flight had 800 kgs of extra fuel than that required as per the DGCA CAR. Flight was normal till Delhi followed with a routine diversion to Jaipur after holding over Delhi for 26 minutes.

The decision of the PIC to divert to Jaipur with fuel on board of 3.1 tons (more than the Minimum Diversion Fuel for Lucknow) was based more on commercial reasons than operational. While releasing the flight as per the flight dispatch, they have cross checked the forecast available and dispatched the flight according to CAT II conditions, which was PICs qualification. On observing that the visibility of Jaipur started deteriorating at 1430 UTC, flight dispatch checked with Jaipur Met Office who confirmed that visibility may go down further. At this stage flight dispatch asked PIC to divert to Jaipur, as Jaipur visibility at that time was within minima and flying time was only 28

minutes. The PIC was advised after consultation with the flight support centre. The consideration at that time was that it will be easier to recover the aircraft as soon as Delhi visibility situation improves, may be by providing CAT III rated crew and ease of transportation of passengers to Delhi from Jaipur by road.

Flight crew while overflying north abeam Jaipur & while diverting to Jaipur had updated themselves with Jaipur & Lucknow weather but only concentrated on the Visibility/ RVR and made the decision to divert to Jaipur with 3.1 tons of fuel (MDF for Lucknow). Whereas by the time (1330 UTC), the flight flew north of Jaipur, the Outside Air temperature (OAT) & Dew Point (DP) had already merged. Though the reported Visibility was 1500 meters, RVR for runway 27 at Jaipur was 2000 but OAT & DP were 14°C/14°C. This would mean that after sun set the visibility will drastically drop due to further drop in OAT. Whereas the Lucknow METAR for 1330 UTC reported Visibility of 2000 meters and temperature & Dew Point as 17°C & 13°C respectively with "No Sig" indicating for the next 2 hours the weather will not change drastically.

As the aircraft had diverted to Jaipur with 3.1 tons of fuel as compared to actual Jaipur diversion fuel 2.7 tons (approx) as per the "Operational Flight Plan" (OFP) gave the flight crew additional fuel of 400 kgs and was the golden lining for the flight crew to commence a second diversion to Delhi. At the time of commencement of diversion from Jaipur to Delhi "Fuel on Board" was 1.7 tons (approx). Expected burn-off was 1.5 tons as per the OFP.

The decision to divert to Delhi and carry out an "Auto-Land" in Delhi by the flight crew was appropriate in the existing low visibility condition (Visibility Zero ; Touchdown RVR 375 m/ Mid 900 m/ Roll out 50 m) and high stress environment. Aircraft touched down with 400 kgs of fuel on board and parked with 150 kgs of fuel on board.

An aircraft commencing a second diversion due to a blocked runway is unprecedented. This can be attributed to the combination of the low visibility conditions which existing (not sudden) at Jaipur, no flight following or effective ground support to the aircraft, large number of aircraft diverting to Jaipur. The

two major factors which saved the situation from resulting into catastrophe were

1. The timely diversion from Delhi i.e. with a **fuel above MDF required for Lucknow** the other safer alternate.
2. Carrying out **auto landing** into Delhi after second diversion.

3.0 CONCLUSION

3.1 FINDINGS

- The operator was carrying out operation of aircraft under SOP and the maintenance of aircraft under CAR 145.
- The Certificate of Airworthiness, Certificate of Registration and Certificate of Release to Service of the aircraft was valid on the date of the incident.
- There was no defect pending on the aircraft prior to the flight which could have contributed to the incident.
- The PIC & the co-pilot were holding valid license on the type of aircraft. Both the crew members held valid medical certificates as per the requirement.
- The crew had undergone pre-flight medical examination at Delhi and nothing abnormal was observed. The BA test was negative.
- All major modifications and Service Bulletins were complied with. There was no snag pending for rectification before the incident flight.
- The visibility at the time of landing was almost nil.
- Spicejet 'Fog plan' has laid down the requirements of a CAT III A qualified operating crew to operate all flights landing in to Delhi (Up to 09:30 hrs IST & after 2000 hrs IST) during fog period.
- The schedule time of arrival of the flight at Delhi was 14:45 (UTC) i.e. 20:15 IST. As per the fog plan a CAT III A qualified crew should have been rostered for the flight.
- PIC who was rostered to operate the flight was CAT II qualified and the First Officer was CAT IIIA qualified. Hence rendering the entire set to

CAT II conditions, this was not in line with Spice Jet Fog Plan for 2013/14.

- The operator has not asked for clarification from the DGCA regarding "Relevant RVR" as referred in the Annexure 2 of CAR Section 8, Series C, Part I, Issue 1.
- On approaching DEL visibility as per ATIS was 150 meters with RVR for runway 28 was 1150m/ 950m/ 550m. The RVR required as per the Crew qualification was 300m/ 125m/ 125m (CAT II).
- When the aircraft was being vectored for runway 28, the roll out RVR for runway 28 dropped to 50 meters which was below minima. The aircraft was in hold at 7000 ft for 26 mins.
- As the RVR for runway 28 at Delhi did not improve and runway 29 RVR was also below minima, the PIC diverted to Jaipur with 3100 kgs of fuel onboard which was also sufficient for diverting to Lucknow.
- The reported Visibility at Jaipur at 1330 UTC was 1500 meters, RVR for runway 27 at Jaipur was 2000 m but OAT & DP were 14°C /14°C.
- The Lucknow METAR for 1330 UTC reported visibility of 2000 meters & temperature & Dew Point as 17°C & 13°C respectively with "No Sig" indicating for the next 2 hours the weather will not change significantly.
- Before commencing the final approach at Jaipur, the visibility/ RVR conditions at Jaipur though were below minima but the PIC was committed to land due fuel.
- Another aircraft which was ahead of this flight suffered substantial damage while landing on runway 27 at Jaipur blocking the only runway available at Jaipur.
- A missed approach was initiated at 3000 ft with total 1715 Kgs fuel onboard.
- Had the aircraft landed in Jaipur it would also have been a "Below Minima Landing".
- The PIC thereafter decided to return to Delhi with the intention of carrying out an Auto land irrespective of reported visibility /RVR.
- With 1200 Kgs of fuel remaining, MAY DAY was declared, low on fuel being the reason for MAY DAY.

- The aircraft was vectored for ILS approach for Runway 28. A safe auto land was carried out at Delhi.
- The fuel onboard at the time of touchdown was 400 Kgs. The fuel remaining at chocks ‘ON’ was approximately 150 kgs.
- **The timely diversion from Delhi to Jaipur i.e. with a fuel above MDF required for Lucknow (the safer alternate) made it possible for the aircraft to reach Delhi after diversion from Jaipur.**
- **Carrying out direct auto landing into Delhi in the visibility condition which was below that of crew qualification was the safest action.**

3.2 PROBABLE CAUSE

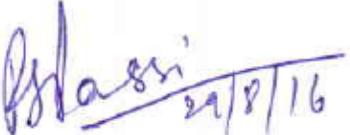
The incident of “emergency landing due low fuel” occurred as

- the aircraft had to carry out second diversion with low fuel on board from alternate airport to the original destination airport due blockage of runway by another aircraft (VT-ESH) which was substantially damaged during landing at the alternate airport.
- there was lack of operational supervision and desired ground support to flight.
- there was lack of oversight of the flight operations
- the earlier diversion from the destination to alternate was due low visibility conditions at the destination airport and as there was deteriorating visibility conditions at the alternate airport, the diversion to Lucknow instead of Jaipur would have been more appropriate.

4.0 RECOMMENDATIONS

The Committee while investigating the accident to the aircraft (VT-ESH) which blocked the runway at Jaipur resulting in this second diversion of flight has given recommendations which are generic in nature and are applicable to all other scheduled operators also. DGCA may carry out one time exercise to ensure that those recommendations are implemented for all the scheduled airlines. Following are the additional recommendations:

- Flight Operations of all scheduled airlines shall ensure that
 - Suitable airfields with relatively better forecasted weather conditions are planned as alternates during the fog season.
 - To increase the comfort level of the crew members during fog season, pilots are encouraged to uplift additional fuel under their discretionary powers.
 - Crew scheduling strictly follows the instructions documented in the Fog Plan regarding crew qualification.
 - Safety audits of Flight Operations must ensure that alternates are filed as per the criteria defined in DGCA CAR Section 8, Series C, Part 1.
 - Flight Dispatchers' & Operations Controllers' must provide regular updates of weather and assist PIC in making decisions of diversions keeping safety of aircraft & passengers in mind.


 29/8/16

(R.S. Passi)

Chairman

Committee of Inquiry



(N.S. Dagar)

Member

Committee of Inquiry



(Dhruv Rebbapragada)

Member

Committee of Inquiry

NEW DELHI
 29th August 2016