GOVERNMENT OF INDIA

FINAL INVESTIGATION REPORT ON ACCIDENT TO SPICEJET BOEING B737-800 AIRCRAFT VT-SGK AT SURAT ON 06.11.2014

AIRCRAFT ACCIDENT INVESTIGATION BUREAU

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 11 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 accident which may help to prevent such future accidents & incidents.

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1.	Aircraft Type	Boeing B 737-800
2.	Nationality	INDIAN
3.	Registration	VT - SGK
4.	Owner	CIT Aerospace Limited
5.	Operator	SpiceJet Limited.
6.	Pilot – in –Command	ATPL holder
	Extent of Injuries	Nil
7.	Co-Pilot	CPL Holder
	Extent of Injuries	Nil
8.	Place of Accident	Surat
9.	Co-ordinates of accident Site	21°06' 57.76" N , 072°44' 30.55" E
10.	Last point of Departure	Surat
11.	Intended place of Landing	Delhi
12.	Date & Time of Accident	6th November, 2014, 1335 UTC
13.	Passengers on Board	151
14.	Extent of Injuries	NIL
15.	Crew on Board	06 (02 – Cockpit +04- Cabin)
16.	Extent of Injuries	NIL
17.	Phase of Operation	Take-off roll
18.	Type of accident:	Animal Strike

(ALL TIMINGS IN THE REPORT ARE IN UTC)

Synopsis

Spicejet B737-800 aircraft VT-SGK was involved in an accident at Surat while taking off to operate scheduled flight SG-622 from Surat to Delhi on 06.11.2014. The flight was under the command of an ATPL holder with First Officer a CPL holder. There were total of 151 passengers and 6 Crew members on board the aircraft.

The pilot requested ATC for runway 04 departure. The aircraft was given taxi clearance via taxiway A. The visibility reported at the time of departure was 6 Kms with calm winds. There was no significant clouding. After entering the RWY 04/22, aircraft backtracked and lined up on RWY 04. Immediately the aircraft was cleared for take-off. During take-off roll, when the aircraft was at around 350 meters from start of runway and at about speed of 78 knots, the left engine of the aircraft hit a buffalo on runway. Immediately take-off was abandoned and aircraft brought back to Apron. There was substantial damage to the engine. There was no fire or injury to any person on board the aircraft.

Ministry of Civil Aviation constituted a Committee of Inquiry to investigate into the causes of the accident under Rule 11 of Aircraft (Investigation of Accidents and Incidents) Rules 2012 vide MoCA order no. AV.15029/01/2014-DG.

1.0 FACTUAL INFORMATION

1.1 History of Flight

On 06.11.2014, Spicejet B737-800 aircraft VT-SGK was involved in an accident at Surat while taking off to operate scheduled flight SG-622 from Surat to Delhi. The flight was under the command of an ATPL holder. The First Officer was a CPL holder. There were total of 151 passengers and 6 Crew members on board the aircraft.

During take-off roll, when the aircraft was at around 350 meters from start of runway and about a meter or so, on the left of the centre line, the left engine of the aircraft hit a buffalo. Immediately take-off was abandoned and aircraft brought back to Apron. There was substantial damage to the engine. There was no fire or injury to any person on board.

As per the fire staff on duty the same aircraft had operated flight SG623 (Delhi-Surat) and arrived into Surat at 1246 UTC. Prior to the arrival of this inbound flight (SG-623), ATC had instructed the fire staff to inspect the runway. The fire staff after carrying out inspection of the runway reported everything normal. After landing the aircraft (SG623), back tracked on runway 22 and vacated the runway via 'A' for parking on bay number 1.

For operating flight SG622, the pilot requested ATC for runway 04 departure. The aircraft was given taxi clearance via taxiway A at 1329 UTC. The visibility reported at the time of departure was 6 Kms with calm winds. There was no significant clouding. Temperature & Dew point were 29°C & 15°C respectively with QNH 1011. After entering the RWY 04/22, aircraft backtracked and lined up on RWY 04 and reported ready for Take-off at 13:35 UTC. Immediately the aircraft was cleared for take-off.

As per the pilot in command, during take-off roll at about speed of 78 knots, he, in his peripheral view saw something moving towards the aircraft. It was otherwise pitch dark and nothing was visible beyond the cone of aircraft lighting. Thereafter he heard a "Bang" sound and it was felt as if the aircraft had

gone over a bump. He immediately called reject and initiated the same. ATC was informed by the flight crew about the reject take off. It was also informed that there was a dog hit on the left side of the aircraft. Since all the parameters were normal and no sign of fire or vibration, the flight crew requested ATC for permission to return to Bay.

With the permission of ATC the aircraft returned to bay 01. The engines were shut down and all necessary checks were carried out prior to and after the shut down. Briefing of the cabin crew and passengers was carried out. During walk around inspection Pilot in Command observed that the engine cowl was badly damaged and there were holes on the sides of engine. It was decided to disembark passengers. Safe normal disembarkation was carried out without any injury.

Fire Station in the mean time called up ATC to confirm whether there is any problem with Spicejet aircraft and asked for permission to enter runway. ATC instructed fire personnel not to enter runway. It was also informed that all operations are normal and it was an animal hit.

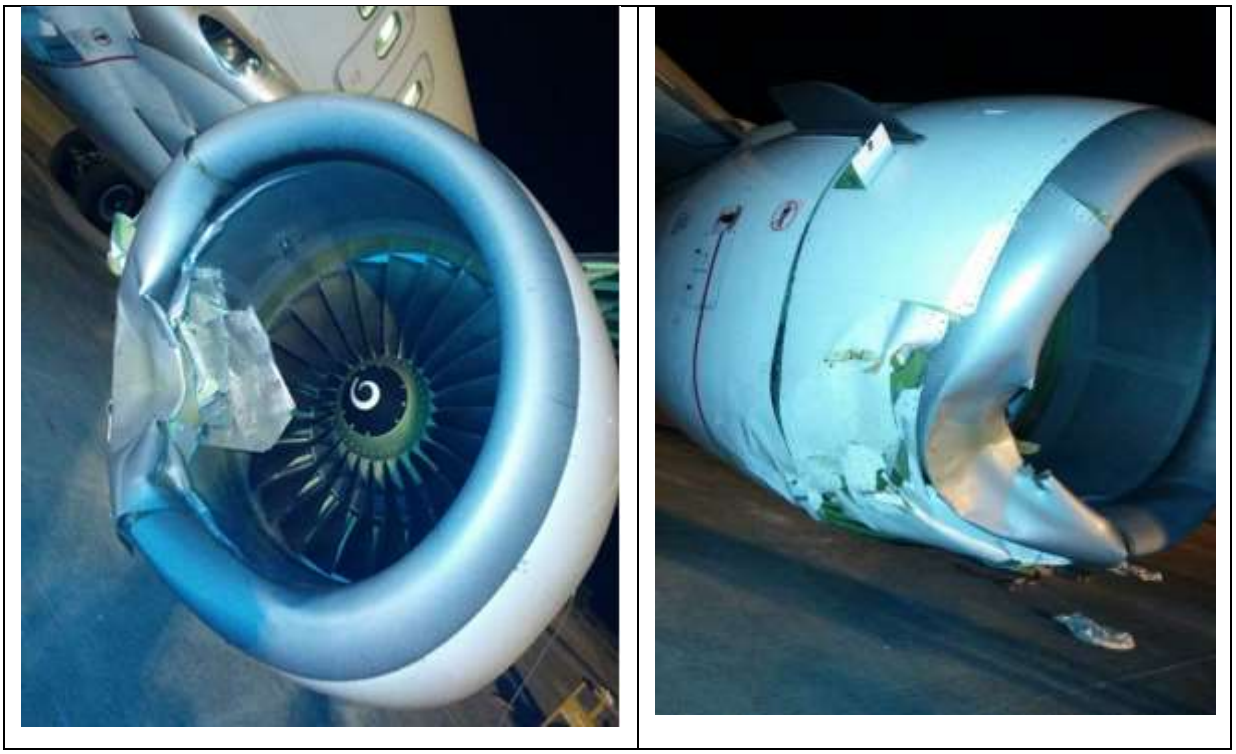
CNS operational jeep requested ATC to cross runway for which the ATC granted the permission. CNS Jeep reported to ATC Tower that there are two Buffalos on runway one is dead and other is roaming on the runway. The runway was immediately closed for operations. After removal of the dead buffalo and inspection of runway it was declared operational.

1.2 Injuries to Persons

INJURIES	**CREW**	**PASSENGERS**	**OTHERS**
FATAL	Nil	Nil	Nil
SERIOUS	Nil	Nil	Nil
~~MINOR~~/NONE	06	151	

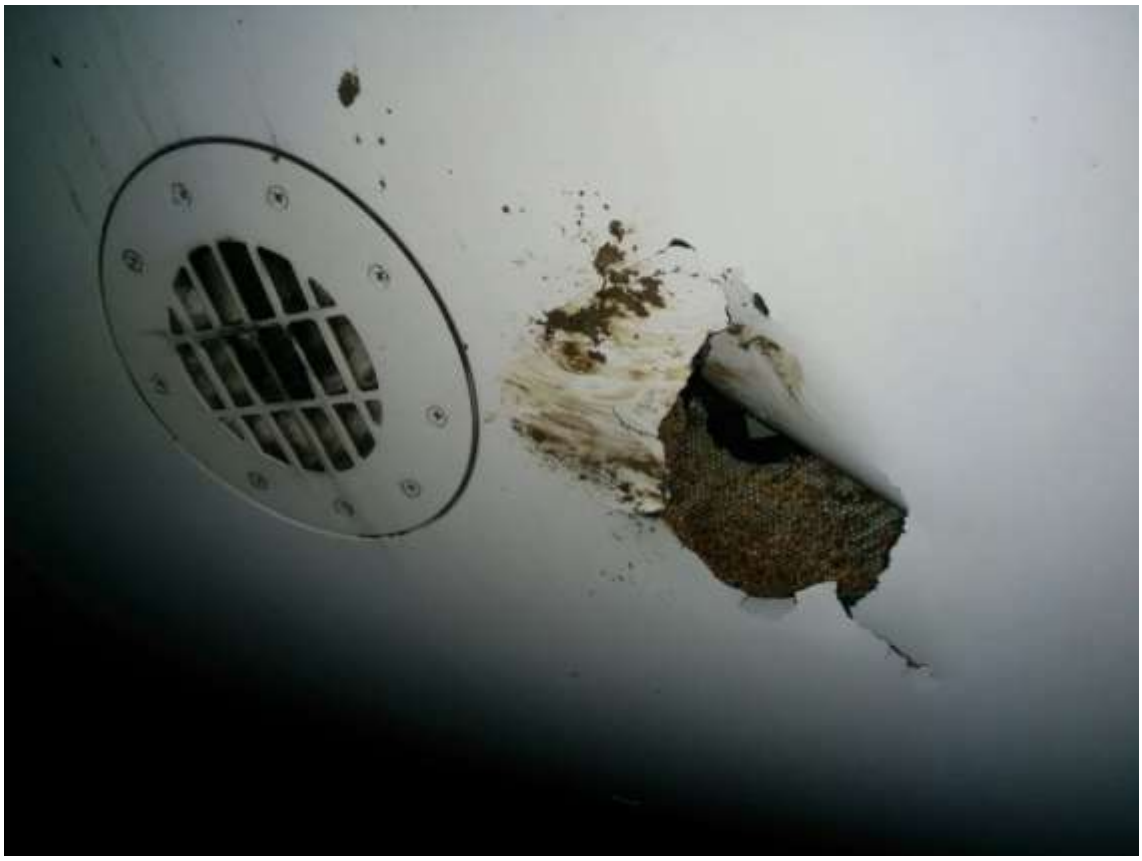
1.3 Damage to the aircraft

The damage to the aircraft was confined to the left engine and the adjoining aircraft exterior only.

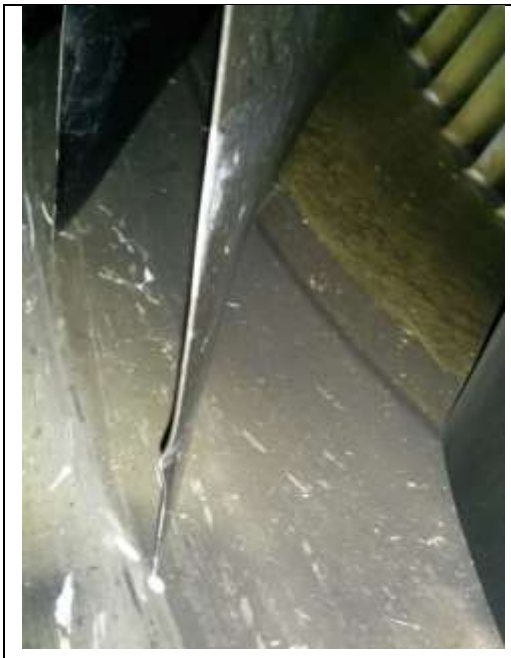


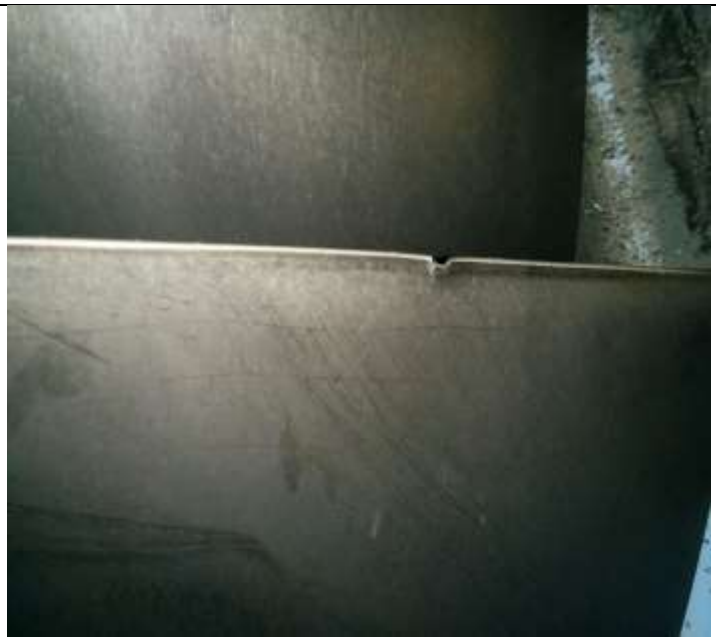
Damage to LH Engine Nose Inlet Cowl near 7 O' Clock Location

Dents on Fan cowl at around 9 O' Clock position



Big Puncture on Inboard Thrust Reverser Sleeve of LH Engine





Fan Blades (9) had nicks, slight bends, chipping and FOD damage

1.4 Other Damage

Nil

1.5 Personnel Information

1.5.1 Pilot-in-Command

AGE	:	25 years
License	:	ATPL Holder
Date of issue	:	24.10.2013
Valid upto	:	23.10.2015
Category	:	Aeroplane
Class	:	Single/Multi engine land
Endorsements as PIC	:	Boeing 737-200/800/900
Medical valid upto	:	06.07.2015
FRTO License	:	13328
Last flown on type	:	04.11.2014
Total flying experience	:	2903:34 hours
Experience on type	:	2601:34 hours
Experience as PIC on type	:	289:00 hours
Total flying experience		
during last 01 year	:	662:32 hours
during last 180 days	:	318:22 hours
during last 90 days	:	209:52 hours
during last 30 days	:	89:58 hours
during last 07 Days	:	19:09 hours
during last 24 Hours	:	01:40 hours

1.5.2 Co-Pilot

AGE	:	26 Years
License	:	CPL Holder
Date of Issue	:	20.11.2008
Valid upto	:	19.11.2018
Category	:	Aeroplane
Class	:	Single/Multi engine Land
Endorsements as PIC	:	Nil
Date of Med. Exam	:	25.06.2014
Med. Exam valid upto	:	24.06.2015
Total flying experience	:	2304:58 hours
Experience on type	:	1969:37 hours
Experience as PIC on type	:	Nil
Total flying experience		
during last 180 days	:	472:17 hours
during last 90 days	:	233:48 hours
during last 30 days	:	81:39 hours
during last 07 Days	:	20:10 hours
during last 24 Hours	:	04:15 hours

1.6 Aircraft Information

Boeing B737-800 is a subsonic, medium-range, civil transport aircraft. The aircraft is installed with two high bypass turbofan engines manufactured by International Aero Engines. The aircraft is designed for operation with two pilots and has passenger seating capacity of 189. The aircraft is certified in Normal (Passenger) category, for day and night operation under VFR & IFR. The maximum take-off weight is 79015 Kgs. The Maximum Landing weight is 65317 Kgs.

The Aircraft length is 39.472 meters, wingspan is 35.8 meters and height is 12.459 meters. The distance between main wheel centers is 5.715 meters. The Ground Clearance is 0.53 meters.

The subject Boeing 737-800 aircraft (MSN 33019) was manufactured in year 2004. The aircraft was registered with DGCA under the ownership of M/S CIT Aerospace Ltd. Ireland. The aircraft is registered under Category 'A' and the Certificate of registration No. 4148.

The Certificate of Airworthiness Number 6257/2 under "Normal category" subdivision Passenger / Mail / Goods was issued by DGCA on 16th August 2012. At the time of accident the Certificate of Airworthiness was current and was valid up to 31st May 2016.

The 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 DGCA. The scrutiny of the Airframe Log book revealed that as on 6th November 2014 the aircraft had completed 36171:14 Hrs and 17096 landings since new.

The aircraft is powered by two CFM Engines. The details of the Engines are given below:

	Engine # 1	Engine # 2
Engine Model	CFM56-7B/26	CFM56-7B/26
Serial Number	890829	803146
TSN	34970:31	5628:57
CSN	16505	3745

The aircraft was last weighed on 11th November 2010 at Ireland and the weight schedule was prepared and duly approved by the DGCA. As per the approved weight schedule the empty weight of the aircraft is 38036.455 Kg. Maximum Usable fuel Quantity is 18730.00 Kgs. Maximum payload with full fuel tanks is 16600.74 Kgs. Empty weight CG is 18.825 meters aft of datum. As there has not been any major modification affecting weight & balance since last weighing, hence the next weighing was due on 10th November 2015.

1.7 Meteorological Information

The accident occurred after 1335 UTC and the METAR of 1300 hours UTC (after sunset) was valid at the time of accident. As per the METARs issued for Surat, following meteorological conditions existed.

Time (UTC)	1300	1600	1630
Wind	CALM	CALM	CALM
Visibility	6000 M	6000 M	6000 M
Clouds	No significant clouds		
Temp	29^0C	27^0C	27^0C
Dew Point	15^0C	20^0C	20^0C
QNH	1011 hPa	1012 hPa	1012 hPa

No significant trend was reported by ATC. As per ATC tape transcript the weather information was also passed by the Surat ATCO to the aircraft while giving the taxiing clearance.

1.8 Aids to Navigation

Surat airport has got only one runway i.e. 04/22 and is equipped with the following navigational aids:

DVOR	:	112.2 MHz
HPDME	:	1020 MHz
ILS	:	CAT - I
LLZ	:	109.1 MHz
LPDME	:	989 MHz
GP	:	331.4 MHz

All the above navigational aids were serviceable.

1.9 Communications

There was always two ways communication between the ATC and the aircraft. At the time of accident, the aircraft was under control of Surat ATC.

1.10 Aerodrome Information

1.10.1 The operational details of Surat Airport are as follows:

Airport Operator	:	Airports Authority of India
Airport Location	:	Surat, Gujarat
Airport ICAO Code	:	VASU (Code 4C)
Airport Coordinates	:	Lat 21°06' 57.76" N & Long 072°44' 30.55" E
Airport Status	:	Licensed (AL/Public/058)
Runway Orientation	:	04/22
Runway Length	:	2250 M
Runway Width	:	45 M

RESA	:	90X90 M (Both RWY 04 & 22)
ILS	:	RWY 22

Surat airport was taken over from State Government and first commercial flight was operated on 6th May 2007. Boundary wall of Surat airport is 12.5 kilometer as constructed by State Government and operational area boundary is of 10.5 Kms.

On the day of accident Runway 04 was in use for takeoff. All the installed Aeronautical Ground Lights were operating normal. Aerodrome Inspection for the purpose of initial Aerodrome License was carried out from 8.6.2011 to 10.6.2011 and provisional license was issued on 8.12.2011 for one year. Later aerodrome inspection was done from 17.7.2013 to 18.7.2013 for renewal of license. Licence was valid on the date of accident. Some of the relevant observations of various inspections carried out for renewal of licence covered the following:

A. Wild vegetation growth all along the length of runway.

B. Runway undulated throughout its length.

C. Open drain

D. Perimeter road not available for full length to serve as emergency access for CFT movement to reach approach, undershoot and overshoot area of the runway.

There is no mention of condition of boundary wall/ breaches along the periphery of airport in the inspection report of 2011. DGCA intimated AAI that, the continued revision of PDC (Probable Date of Completion) on pending CAR non compliances and DGCA observations was not considered and further exemption not granted. AAI was also advised to define a firm time frame for pending non compliances.

Aerodrome Surveillance Inspection which was carried out by DGCA from 17/7/2013 to 18/7/2013 for ensuring continued compliance of regulatory requirements, highlighted broken boundary wall on both sides of runway. The PDC submitted to AAI Hqrs by Surat airport as per document was 07.07.2014. However the proposal for construction of the damaged / broken compound wall was found initiated only on 10.09.2014. Further, there were no records to show that the risk assessment submitted to DGCA was actually carried out by following proper mitigation steps.

1.10.2 Airport inspection (after the accident) report

As part of the investigation process DGCA team carried out the inspection of Surat airport including inspection of the aerodrome Perimeter Fencing and Boundary wall on 07.11.2014 and 08.11.2014, the day after the accident. Following are the excerpts of the report:

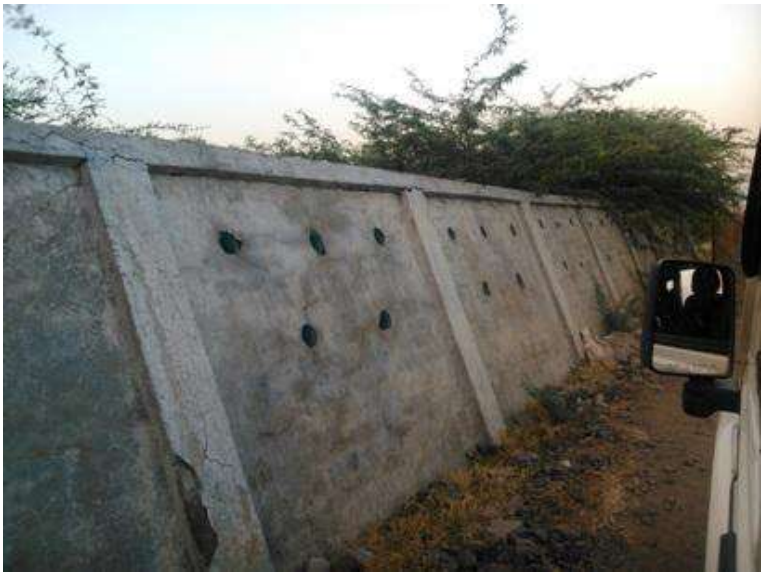
1.10.2.1 Aerodrome Perimeter Fencing

The area on south side of Surat airport beyond 04 end of runway is low lying area and not accessible as perimeter road is not available in this area. This area is accessible only from outside of airport. Outside inspection of boundary wall revealed following:

a) In west of runway towards Dumas side, 05 Chain Links of the fencing were found damaged, (Each Being 2M X 2.5 M) leading to big gaps.

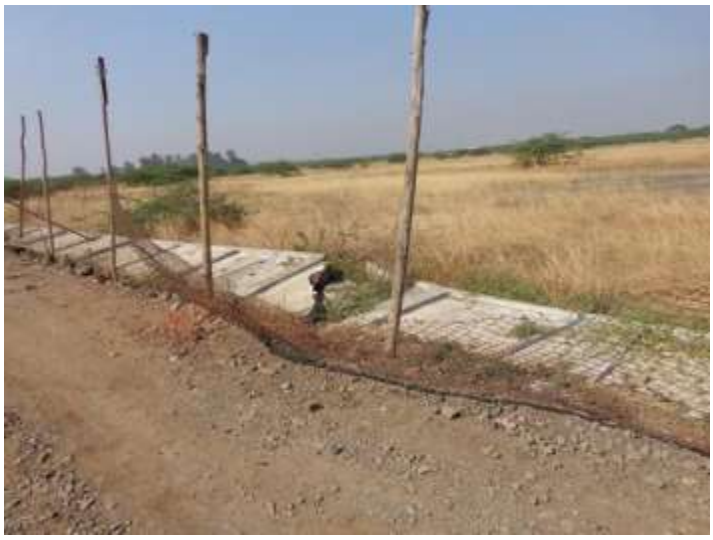
Gap between Chain Link fencing and Ground

b) Columns of 110 meters brick wall in SW end of runway were found tilted. Some of these were found in much depleted condition.



Tilted and damaged Wall

c) Towards Southwest of the runway, chain link fence supported by wooden ballies were observed for a distance of approx. 172 M. Approx. 36 of these were found either damaged or with big gaps from Ground.



Chain Link fencing with wooden ballies without solid base

d) Aquaculture activities (Prawn Farming) just outside the boundary of Aerodrome, a major attractant of wild life.

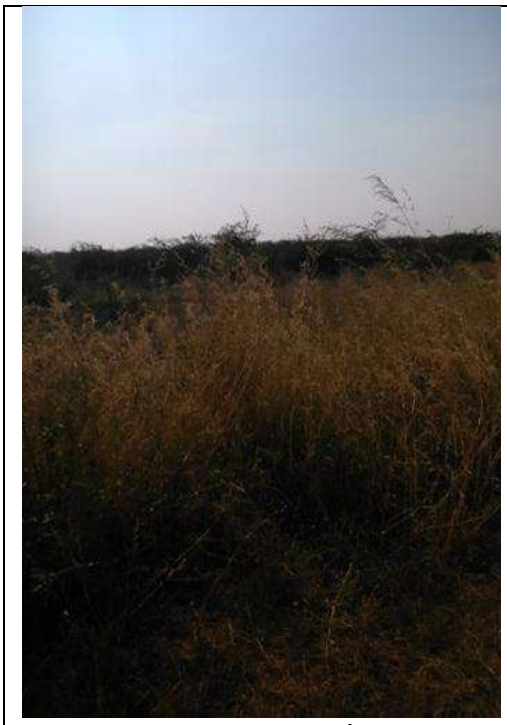
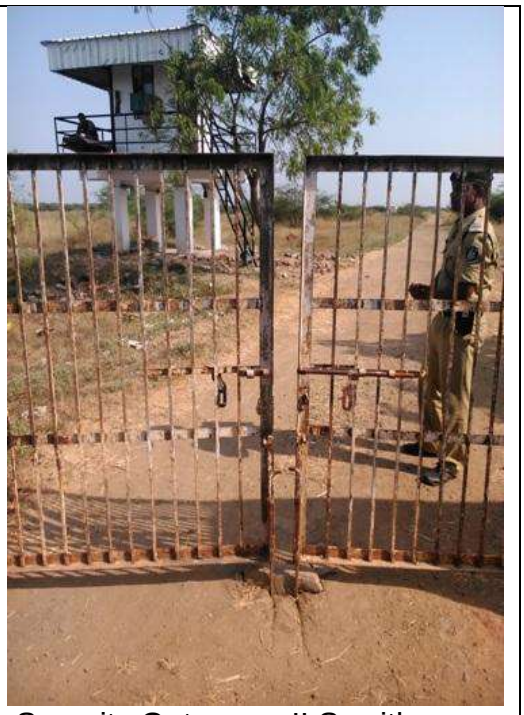
1.10.2.2 Aerodrome Operational Area Inspection

a) At the time of inspection heavy vegetation throughout the operational area was found approx of 3 - 4 Ft height. This acted as a camouflage / shelter for wild animals and birds. Second Buffalo which was reported by CNS Jeep after the accident was again spotted near the runway on 07.11.2014 a day after the accident.

b) Beyond Localizer Antenna towards the West of runway low lying area with standing water bodies. Also towards South of runway water bodies patches found which is an attractant for Bird Hazard.

c) Total six number of security Gates are there. During inspection Security Gate near Localizer was observed with gaps from Ground large enough for Dogs and small Wildlife to enter the Operational area.

d) On 08.11.2014, the Aerodrome Operator started with the process of getting the vegetation mowed.

 Heavy Vegetation	 Security Gate near ILS, with gaps

1.10.2.3 Aerodrome Inspection Records

a) As per AAI document on Aerodrome Licensing daily inspection for perimeter and fence is required to be done but no record was being maintained for the same.

b) Airport Authority Manual on Aerodrome Licensing of All Airports dated Jan 2013, Para 4.5.7 refers to, 'Weekly Inspection by WSO (ATC) for Boundary Wall/ Fence. But no proper format was found being maintained. Log of Wildlife was not being properly maintained. The last entry in logbook for inspection was found made on 25.9.2014.

c) From various records it is noted that there was Wild Life Hazard menace at Surat Airport; Dog Menace. These incidents were reported to local police and municipality was called to catch these animals.

1.11 Flight Recorders

Both Solid State Cockpit Voice Recorder (SSCVR) and Solid State Flight Data Recorder (SSFDR) were downloaded and readout carried out. The information available from these units has been utilized for investigation purposes wherever relevant.

1.12 Wreckage and Impact Information

The aircraft impacted with the buffalo and the major impact damages were borne by the engine cowling and fan area. The aircraft after impact taxied to the bay under its own power. The animal body was found approximately 01M Left of Centerline of Runway 04 & about 350 M from start of runway.

1.13 Medical and Pathological Information

Crew had undergone Preflight Medical on the day before the first flight of the day at Delhi and no abnormality was observed. The flight from Surat was a turnaround flight.

1.14 Fire

There was no fire either before or after the accident.

1.15 Survival Aspects

The accident 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 accident with the aircraft endorsed on the SOP permit. The aircraft maintenance is carried out under CAR 145 issued by DGCA.

1.17.2 Airports Authority of India

The Government of India passed the International Airport Authority Act in 1971, which created the International Airports Authority of India which acted as, in charge for planning, managing, and developing India's four international airports. Another authority, the National Airport Authority was created in 1986 to take over the management of India's domestic airports, and develop and operate them on corporate principles. The National Airports Authority and the International Airports Authority of India were merged in 1995 under the single Airports Authority of India (AAI), in charge of building, managing and developing Indian civil aviation infrastructure, managing Indian airspace, and providing en route navigation facilities to aircraft flying in Indian airspace.

The functions of AAI are as follows:

1. Design, Development, Operation and Maintenance of international and domestic airports and civil enclaves.
2. Control and Management of the Indian airspace extending beyond the territorial limits of the country, as accepted by ICAO.
3. Construction, Modification and Management of passenger terminals.
4. Development and Management of cargo terminals at international and domestic airports.
5. Provision of passenger facilities and information system at the passenger terminals at airports.
6. Expansion and strengthening of operation area, viz. Runways, Aprons, Taxiway etc.
7. Provision of visual aids.
8. Provision of Communication and Navigation aids viz. ILS, DVOR, DME, and Radar etc.

Safety oversight is a function through which effective implementation of the safety-related Standards and Recommended Practices (SARPs) contained in the Annexes to the Convention on International Civil Aviation and related ICAO documents is ensured. The goal is to ensure that operators and service providers

maintain an acceptable level of safety in their operations. In order to fulfill the above requirement and those of the SMS, in AAI, each licensed aerodrome and aerodrome applying for Aerodrome license are required to develop their Safety Management System (SMS) Manual. This Manual is also required to include all local practices to improve and enhance safety that are being practiced at aerodrome/location.

As per the Safety Policy, AAI regards safety as their first priority and shall provide highest reasonable standard of safety within Air Navigation Services and Airport operations. In this regard they shall adopt, plan and establish an explicit, proactive and systematic SMS for their core activities and shall review it periodically. Further, appropriate resources are to be provided both human and financial necessary to support the implementation & management of safety. The policy also emphasizes that AAI shall establish comprehensive procedures for reporting, collection, analyzing and storing of data on hazards, incidents and accidents and shall strive for continual improvements through safety assurance

As one of the main safety objectives, AAI shall ensure that risk of any aircraft accident/ incident is reduced to and maintained at or below “As Low As Reasonably Practicable”. It shall also be ensured that safety is maintained at appropriate level in airside operations, by identifying & managing hazards in the operational area to keep risks to aircraft operations at minimum acceptable level.

AAI has got a Directorate of Aviation Safety as a custodian of SMS and its functions include the following:

- Detect the weaknesses in the functions and the practices in the activities of all departments of AAI which may affect the safety of the system(s).
- Implement effective safety programs in all areas of operations and passenger facilities with a view to provide safe environment for aircraft operations and passengers at all AAI airports.
- Carry out annual audit of all AAI airports, civil enclaves and other facilities with the objective of identifying operational and system deficiencies, hazards and trends at ground level.

In order to inculcate the safety culture at the airports of AAI, shall also involve the other stake holders and the regulator in the safety promotion by practicing the laid down procedures leading to a safety culture. Under Model-development of Movement areas of all airports, it is to be seen that there is, a proper security wall of the airports; access and surveillance systems; security equipments and CCTV around the airports.

1.18 Additional information

1.18.1 ICAO Annexure 14 Volume 1 chapter 9 (Wild Life)

The relevant extract regarding the presence of wildlife from the above Annex in the aerodrome vicinity and actions required are as follows:

Note: The presence of wildlife (birds and animals) on and in the aerodrome vicinity poses a serious threat to aircraft operational safety.

9.4.1 The wildlife strike hazard on, or in the vicinity of, an aerodrome shall be assessed through:

a) the establishment of a national procedure for recording and reporting wildlife strikes to aircraft;

b) the collection of information from aircraft operators, aerodrome personnel and other sources on the presence of wildlife on or around the aerodrome constituting a potential hazard to aircraft operations; and

c) an ongoing evaluation of the wildlife hazard by competent personnel.

9.4.2 Wildlife strike reports shall be collected and forwarded to ICAO for inclusion in the ICAO Bird Strike Information System (IBIS) database.

9.4.3 Action shall be taken to decrease the risk to aircraft operations by adopting measures to minimize the likelihood of collisions between wildlife and aircraft.

9.4.4 The appropriate authority shall take action to eliminate or to prevent the establishment of garbage disposal dumps or any other source which may attract wildlife to the aerodrome, or its vicinity, unless an appropriate wildlife assessment indicates that they are unlikely to create conditions conducive to a wildlife hazard problem. Where the elimination of existing sites is not possible, the appropriate authority shall ensure that any risk to aircraft posed by these sites is assessed and reduced to as low as reasonably practicable.

9.4.5 Recommendation — States should give due consideration to aviation safety concerns related to land developments in the vicinity of the aerodrome that may attract wildlife.

Note: The requirements of ICAO Annexure 14 Volume 1 are incorporated verbatim in Civil Aviation Requirement Section 4 Series 'B' Part 1.

1.18.2 ICAO Annexure 14 Volume 1 chapter 9 - (Fencing)

9.10.1 A fence or other suitable barrier shall be provided on an aerodrome to prevent the entrance to the movement area of animals large enough to be a hazard to aircraft.

9.10.2 A fence or other suitable barrier shall be provided on an aerodrome to deter the inadvertent or premeditated access of an unauthorized person onto a non-public area of the aerodrome.

Note 1: This is intended to include the barring of sewers, ducts, tunnels, etc., where necessary to prevent access.

Note 2: Special measures may be required to prevent the access of an unauthorized person to runways or taxiways which overpass public roads.

9.10.3 Suitable means of protection shall be provided to deter the inadvertent or premeditated access of unauthorized persons into ground installations and facilities essential for the safety of civil aviation located off the aerodrome.

Note The requirements of ICAO Annexure 14 Volume 1 are incorporated verbatim in Civil Aviation Requirement Section 4 Series 'B' Part 1.

1.18.3 ATC Procedures for Inspections.

As per the procedures laid down in the AAI Ops Circular No. 05 of 2011, Inspection of Runway, Taxiways, Aprons and fencing etc. has to be a regular affair. As per Para 4.5 which states that the general inspection of operational area should be carried out every day and attention shall be paid to following points (only salient points are mentioned):

- Operational wall/fencing, if any breach is observed it must be repaired forthwith.
- Vegetation check - If excessive growth is obscuring lights, signs, markers etc. the same should be urgently removed by the engineering staff - Civil Wing.
- Obstacles which are authorized should be checked for proper markings and lightings and unauthorized obstacles must be reported to the in-charge of the Aerodrome for prompt action.

Few of the salient procedures for reporting of unserviceability laid down in the circular are:

- All the un-service-abilities noticed during an inspection shall be reported to the control tower. The Tower Officer in turn shall bring the same to the notice of the in-charge of the aerodrome for appropriate action.
- Inspection of entire operational area should be carried by the duty officer-tower/In-charge of the aerodrome along with JE/AE at mutually agreed time.
- Routine runway inspection may be carried out at Metro Airports by the GFS officials and at non-metro airports, runway inspection may be carried out by Tower Officials/ Aerodrome Assistants/Fire Foreman i.e. the trained manpower for airside management is provided.

Frequency of inspection

Few of the salient points as per the circular are as follows:

- Inspection of Movement area should be regular and as frequent as possible.

- For runways where ATC watch hours are from dawn to dusk or H-24, at least four inspections as given below shall be carried out:
  a) Dawn
  b) Morning
  c) Afternoon and
  d) Dusk.

  As per Para 4.5.7 of the Aerodrome Manual of Surat:

Inspection Procedure and Frequency

Detailed Runway Inspection Procedure

Detailed Runway Inspection is to be carried out by Duty Officer (ATC) before opening of scheduled watch hours.

Note: - In case of limited ATCO strength may be carried out by fire personal.

Checklist for detailed RWY Inspection

At least the following facilities should be inspected visually during detailed runway inspection.

1. Foreign object of damage (FOD).
2. Runway surface condition (wet/damp/water patches/flooded).
3. Threshold lights Rwy04/22.
4. Approach lights runway 04/22.
5. Runway edge lights.
6. PAPI lights Rwy 04/22.
7. Apron edge lights.
8. Apron flood lights.
9. Taxiway edge lights.
10. Wind direction indicator (Wind Cone)
11. Movement area.
12. Bird’s Activity.

Visual Runway Check

Quick Rwy check will be carried out before arrival and departure of a flight or when required by ATC. A Quick runway inspection is to be carried out before closing of watch hours.

At least following has to be inspected during quick runway inspection. Memorandum

1. Foreign object of damage (FOD).
2. Runway surface (Wet/damp/water patches/flooded).
3. PAPI Rwy 04/22.
4. Approach lights Rwy 04/22.
5. Runway edge lights.
6. Bird's activity.

The person carrying out Runway Check gives a report on Walkie-Talkie to the Control Tower.

All runway inspections carried out by ATC officers and Fire Staff shall be entered in the runway inspection register kept in the Control Tower for the purpose.

1.18.4 Evidence collection & factual information

The subject accident was reported to the office of AAIB by the Airline. After the accident a team of officers experienced in investigation were deputed to the accident site from 07.11.2014 to 08.11.2014 for collection of evidences including photography. The collected evidences and preliminary factual information was provided to the Committee of Inquiry.

The details provided gave ample information on the airport and on reasons which resulted in animals entering the airport. Ample photographs of the boundary wall breaches along with the sources attracting the animals were also provided. As far as aircraft is concerned localized photographs of the damages to engine and adjoining area were provided.

None of the photographs covered the whole aircraft or was taken as a long-shot. Though CVR tape transcript covering the flight from take-off roll was provided but the audio recording was not available to the Committee.

1.18.5 Night Blind Spot

Light is absorbed in the pigments of the retinal receptors. Then a chemical reaction transforms this energy into an electrical pulse that is transmitted via the optic nerve (and tract) to the occipital (at the back of the skull) lobes of the brain. The retina is composed of two types of neural receptors: rods and cones. Cones are associated with high visual acuity and color vision, but require sufficient light. Rods are associated with colorless vision, poor acuity, but higher sensitivity than cones in dim light conditions.

Due to the distribution of rods and cones on the retina, if the ambient light is below cone threshold light intensity, a blind spot 5 to 10 degrees wide develops in the center of the visual field. As a result, an object viewed directly at night may not be detected because of the night blind spot and, if it is detected, may fade away.

1.19 Useful or Effective Investigation Techniques

Nil

2. ANALYSIS:

2.1 Serviceability of the aircraft

The aircraft had a valid Certificate of Airworthiness and a Valid Certificate of Registration at the time of accident. The scrutiny of the Airframe Log book revealed that as on 6th November 2014 the aircraft had completed 36171:14 Hrs (TSN) and 17096 landings (CSN).The aircraft is powered by two CFM Engines. The Engine # 1 had logged 34970:31 hrs, 16505 cycles and Engine # 2had logged 5628:57 hrs, 3745 cycles since new. Scrutiny of the aircraft records further revealed that all the modifications on the aircraft were found to be complied with at the time of accident. Scrutiny of the snag register revealed that there was no snag reported on the aircraft prior to the accident flight. Prior to accident flight the aircraft weight & balance was well within the operating limits.

The aircraft and its Engines were maintained as per the maintenance program consisting of calendar period/ flying Hours or Cycles based maintenance as per maintenance program approved by DGCA. The aircraft was last weighed on 11th November 2010 at Ireland and the weight schedule was prepared and duly approved by the DGCA at Delhi.

From the above it is inferred that serviceability of the aircraft was not a contributory factor to the accident.

2.2 Weather

The weather at the time of accident at Surat was fine with visibility reported to be 6000 meters and wind calm. It is inferred that the weather was not a contributory factor to the accident.

2.3 Crew Qualification

Both the cockpit crew i.e. Pilot-in-Command and Co-pilot were qualified to operate the type of aircraft. Pilot - in - Command was holding a valid ATPL license and co-pilot was holding a valid CPL license. The aircraft was cleared for

take-off at 1335 UTC and at that time it was pitch dark. He, in his peripheral view saw something moving towards the aircraft. At that time nothing was visible beyond the cone of aircraft lighting. The pilot immediately rejected take-off once he heard a bang sound.

Crew was qualified to undertake the flight.

2.4 ATC Procedures

As per the records available with Surat Aerodrome the procedures laid down in the AAI Ops Circular 05 of 2011 and Operational Manual of Surat were not being carried out in timely manner. As per the conversation between tower and fire staff on walkie – talkie just before the departure at 1310 they had withdrawn two bird chasers posted near Glide path and in between taxiway A & B. There was no inspection carried out as per departure procedure before the aircraft was cleared for take-off. Only inspection which was carried out was at watch opening time at 0530 hrs UTC.

It is therefore inferred that Non-adherence to the standard procedures is a contributory factor to the accident.

2.5 Aerodrome Boundary Conditions (Fencing):

Surat Aerodrome is a licensed aerodrome. Boundary wall of Surat airport is 12.5 kilometer and operational area boundary is of 10.5 Kms. Aerodrome Inspection for the purpose of initial Aerodrome License was carried out from 08.6.2011 to 10.6.2011 and provisional license was issued on 08.12.2011 for one year. There is no mention of condition of boundary wall/breaches along the periphery of airport in the inspection report of 2011. Later aerodrome inspection was done from 17.07.2013 to 18.07.2013 for renewal of license. License was valid on the date of accident. Some of the relevant observations of various inspections carried out for renewal of license covered the following:

A. Wild vegetation growth all along the length of runway.
B. Runway undulated throughout its length.
C. Open drain

D. Perimeter road not available for full length to serve as emergency access for CFT movement to reach approach, undershoot and overshoot area of the runway.

DGCA intimated AAI that the continued revision of PDC on pending CAR non compliances and DGCA observations was not considered and further exemption not granted. AAI was also advised to define a firm time frame for pending non compliances.

Aerodrome Surveillance Inspection which was carried out by DGCA from 17/7/2013 to 18/7/2013 for ensuring continued compliance of regulatory requirements, highlighted broken boundary wall on both sides of runway. The PDC submitted to AAI Hqrs by Surat airport as per document was 07.07.2014. However the proposal for construction of the damaged / broken compound wall was found initiated only on 10.09.2014. Further, there were no records to show that the risk assessment submitted to DGCA was actually carried out by following proper mitigation steps.

There were several breaches found during the aerodrome inspection post-accident which further reveals that the laid down procedures were not followed. Hence Non-adherence to the above mentioned standard procedures is a contributory factor to the accident.

2.6 Circumstances leading to the Accident

It is amply clear that the aircraft hit a buffalo during take-off roll at around 78 knots. This is also clear that the animals entered and were entering the airport through the breaches in the boundary wall or because of absence of secured boundary wall. The relevant question remains or comes to mind is that, “Was the buffalo already on the runway or it came on the runway after the aircraft started take off roll”.

Whatever photographs were made available to the Committee indicate that the location of the aircraft where it had hit the animal lied on the inner side of the engine i.e. towards the fuselage roughly between 7 & 8 O’ clock position.

Further the photographs also indicate that this was the only impact damage and had transmitted longitudinally (to the aircraft axis).

The photographs of the aircraft vis a vis the animal hit by the aircraft and the damage to the engine and its location indicates that the animal was on the runway at the time of initiation of take-off roll. The CVR and ATC transcripts indicate that the take-off roll was probably initiated in continuation to the lining up on the runway.

Light is absorbed in the pigments of the retinal neural receptors of the eye i.e. rods and cones. If the ambient light is below cone threshold light intensity, a blind spot 5 to 10 degrees wide develops in the center of the visual field and an object viewed directly at night may not be detected because of this night blind spot. Since rods are much more sensitive to light than cones, objects can be detected by an eccentrically fixation, i.e. looking at the objects under an angle of 17-20 degrees to one side, above or below. This might have resulted in non-spotting of the animal during take-off roll.

3. CONCLUSIONS:

3.1 Findings:

a) The Certificate of Airworthiness and the Certificate of Registration of the aircraft was current and valid on the date of accident.

b) The CRS was valid on the day of accident.

c) All the concerned Airworthiness Directive, Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engine were found complied with.

d) Prior to the accident flight aircraft had operated flight SG623 (Delhi-Surat) and arrived into Surat at 1246 UTC. The flight was uneventful.

e) The weather at the time of accident at Surat was fine with visibility 6000 meters and winds calm.

f) Several breaches existed in the boundary wall of the airport. There was heavy vegetation throughout the operational area ranging between 3 to 4 feet height.

g) The aircraft operated flight from Delhi to Surat and was operating turn-around flight to Delhi.

h) The aircraft was cleared for take-off and during take-off roll at around 78 knots the left engine of the aircraft hit a buffalo on runway.

i) Take-off was abandoned and as all the parameters was normal without any sign of fire or vibration crew thought that the aircraft might have hit a dog, brought the aircraft back to the Apron after taking permission from ATC.

j) At apron it was observed that there was substantial damage to the engine. There was no fire or injury to any person on board.

k) Normal disembarkation of passengers was carried out.

l) As per AAI document on Aerodrome Licensing daily inspection for perimeter and fence was to be done but no record was being maintained for the same.

m) No proper format was found being maintained for Weekly Inspection by WSO (ATC) for Boundary Wall / fence.

3.2 Probable cause of the accident:

The accident was caused as the aircraft during its initial take-off roll hit an animal (buffalo) standing on the runway, resulting in damage to its engine.

The animal entered the operational area and the runway because of several breaches in the boundary wall.

4. SAFETY RECOMMENDATIONS:

4.1 Increase surveillance by DGCA at aerodromes known to be prone to wildlife activity and ensure proper follow up action. The same may be harmonised with the process of aerodrome license/ renewal process.

4.2 Wildlife Control and Reduction (ICAO Doc 9137) gives clarification of vegetation management, data collection and training. Various Passive and Active management techniques for Wildlife Hazard management may be implemented accordingly at Indian Airports.

4.3 Aerodrome manuals to have specific mitigation technique and process with personnel responsible for Wildlife/ Bird Hazard management rather than generic information.

K. Ramachandran 3/1/17

K Ramachandran
Member, Committee of Inquiry

3/1/2017

(R S Passi)
Chairman, Committee of Inquiry

Place : New Delhi
Date : 03.01.2017