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FINAL REPORT ON SERIOUS INCIDENT INVOLVING CESSNA CITATION 525A-CJ2+ AIRCRAFT VT-BRT OF M/s TAAL ON 11.09.2019 AT NANDED AIRPORT, MAHARASTRA, INDIA.

Amit Kumar
Investigator

Dinesh Kumar
Investigation-In-Charge

FOREWORD

In accordance with Annex 13 to the Convention on International Civil Aviation Organization (ICAO) and Rule 3 of Aircraft (Investigation of Accidents and Incidents), Rules 2017, the sole objective of the investigation of an accident shall be the prevention of accidents and incidents and not to apportion blame or liability.

This document has been prepared based upon the evidences collected during the investigation, opinion obtained from the experts and laboratory examination of various components. Consequently, the use of this report for any purpose other than for the prevention of future accidents or incidents could lead to erroneous interpretations.

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DRAFT FINAL REPORT ON SERIOUS INCIDENT TO M/s TAAL CESSNA CITATION 525A-CJ2+ AIRCRAFT VT-BRT AT NANDED ON 11/09/2019

1.	Aircraft Type	: Cessna Citation 525A-CJ2+
	Nationality	: Indian
	Registration	: VT - BRT
2.	Owner	: M/s Cessna Finance Corporation.
3.	Operator	: M/s Taneja Aerospace and Aviation Ltd.
4.	Pilot – in –Command	: ATPL holder on type
	Extent of injuries	: Nil
5.	First Officer	: CPL Holder on type
	Extent of injuries	: Nil
6.	Place of Incident	: Nanded Airport, Maharashtra
7.	Date & Time of Incident	: 11th Sep 2019, 1827 UTC
8.	Last point of Departure	: Mumbai
9.	Point of intended landing	: Nanded
10.	Type of operation	: Non-Scheduled Operation
11.	Crew on Board	: 02
	Extent of injuries	: Nil
12.	Passengers on Board	: 06
	Extent of injuries	: Nil
13.	Phase of operation	: Landing
14.	Type of incident	: Runway Excursion

(ALL TIMINGS IN THE REPORT ARE IN UTC)

SUMMARY

On 11th Sep 2019, M/s Taneja Aerospace and Aviation Ltd. Cessna Citation 525CJ2+ aircraft VT-BRT was involved in a serious incident at Nanded Airport while operating a flight from Mumbai to Nanded. The aircraft was under the command of a pilot holding valid ATPL on type with first officer holding valid CPL on type. There were 06 passengers on board the aircraft.

The aircraft took-off from Mumbai for Nanded at 1734 UTC with 06 passengers on board. The enroute flight was uneventful. Initially, ATC Nanded assigned runway 28. However, crew requested for runway 10 and aircraft approached runway 10 for landing. The aircraft landed at Nanded airport at 1827 UTC and immediately after touchdown, the aircraft started veering to the left. Finally, aircraft exited the runway on left after rolling for about 700 meters. All passengers and crew were unhurt and deplaned normally. There was no pre or post incident fire.

The occurrence was classified as Serious Incident as per the Aircraft (Investigation of Accidents and Incidents) Rules, 2017. DG-AAIB vide Order No. INV-12011/21/2019-AAIB dated 12.09.2019 appointed Mr. Dinesh Kumar, Air Safety Officer as IIC and Mr. Amit Kumar, Safety Investigation Officer as an Investigator.

Initial notification of the occurrence was sent to NTSB, USA and TSB, Canada along with ICAO as per requirement of ICAO Annex 13.

1. FACTUAL INFORMATION

1.1 HISTORY OF THE FLIGHT

On 11.09.2019, M/s TAAL had planned to operate a non-scheduled medical flight from Mumbai to Nanded. The flight was under the command of an ATPL holder pilot (Pilot Flying) with a CPL holder pilot as Co-Pilot (Pilot Monitoring). There were 06 passengers and 02 crew on board the aircraft.

The ETD of the flight from Mumbai was 1600 UTC. However, the medical team that was to travelling to Nanded got delayed and therefore ETD was revised to 1715 UTC and revised flight plan was filed. Accordingly, the crew reported for duty at Mumbai airport at around 1610 UTC.

After briefing, FO obtained FIC/ADC from the MLU and headed to the aircraft. External inspection of the aircraft was carried out and the aircraft was powered to check the fuel quantity. A total of 400 lbs fuel was uplifted. At around 1630 UTC, both crew underwent pre-flight BA tests. The result of the tests were satisfactory. After carrying out preflight checks, clearance was obtained from ATC Mumbai as per the route filed in the Flight Plan.

The crew informed Mumbai Ground control, about passengers on board and it being a Medical Flight. They got priority over other aircraft for pull out and start.

After clearance, both engines were started at 1725 UTC. Mumbai Ground granted clearance for taxi via R, S X32, S1 E1 runway holding point 27. While taxiing, crew fed all relevant data into the FMS and calculated required V speeds. The V1, V2 and V_T calculated for the flight were 107, 108 and 136 respectively. The runway length required based on the calculation was found to be 3832 feet. After approaching runway holding point, Ground asked the crew to report to Tower on 118.1 MHz.

Aircraft took off at 1734 UTC from runway 27. After takeoff, aircraft continued to climb to FL70, and crew changed over to Radar. Thereafter, crew requested permission for FL250 and same was approved by ATC Mumbai.

At 1757 UTC, while the aircraft was at a distance of approx. 148 Nm from the Nanded, crew came in contact with ~~on~~ Nanded Tower frequency on 118.75 MHz and requested for MET information at destination. Aircraft was provided with the latest weather report of 1730 hrs UTC at Nanded wherein reported winds were 280°/05 knots. The crew was also apprised about runway in use, which was RWY 28. However, crew requested for RWY 10. Nanded Tower informed the crew that approach light for runway 10 was unserviceable.

While the aircraft was in contact with Mumbai Radar, it was advised to make contact with Nagpur or Bidar ATC to coordinate for further descent. However, crew were unable to make a positive contact with either Nagpur or Bidar and requested Nanded ATC to coordinate for their further descent to Nanded. ATC Nanded transmitted that they would coordinate with Nagpur ATC for their descend.

At 1806 UTC, crew informed ATC Nanded that they are ready for descent. ATC Nanded gave "descend to FL70" and requested crew to report when at 25 DME. At 1819 UTC, ATC Nanded passed the information to continue descend to FL 33 three thousand three hundred feet. Aircraft was cleared for VOR-DME approach for runway 28 and asked to report while leaving NDD. Crew again requested for runway 10 and were informed by ATC Nanded about the unserviceability of approach lights at runway 10. In spite of unavailability of approach lights, crew informed that they will come for runway 10. Thereafter, ATC Nanded approved runway 10 for landing and crew were asked to report once established on final approach track for runway 10. As per the statement of PIC, he could see wide spread Red Cell towards runway 28 on his weather radar which was not favourable for landing, hence he decided for VOR approach for runway 10.

While the aircraft was in descent phase, FO fed all data into the FMS, carried out self-briefing for runway 10. After feeding all information into FMS, PIC noticed that wind component was headwind. He instructed the FO to check for the latest winds. At 1823 UTC, ATC Nanded reported wind 250°/ 09 knots. $V_{app,}$ V_{ref} and landing distance required based on the winds was calculated as 118 knots, 111 knots and 5837 feet respectively. At 1825 UTC, crew reported to ATC that the aircraft ~~is~~ was established on final approach track on runway 10. Subsequently, ATC cleared the aircraft to land on runway10 and updated wind was provided to the crew. Crew acknowledged wind 250 degrees and 10 knots. FO requested ATC Nanded to increase the intensity of runway edge lights from 4 units to 5 units at 18:25:37 UTC and same was done by ATC.

At 1826 UTC, aircraft landed on runway 10 and immediately after touchdown started deviating to the left. FO called out "Slightly Right Right" and crew attempted to bring the aircraft back to the centreline. However, the aircraft kept deviating to the left and exited the runway at a distance of 700 m from the threshold. The aircraft travelled around 1300 m from threshold before coming to a halt at a distance of 26 m from the runway edge.

At 18:27:15 UTC, crew transmitted to ATC that aircraft has exited the runway. Crash alarm and firebell were activated by ATC tower and fire control room was informed of the incident.

All passengers had deplaned normally by the time CFT reached the site. Both engines were shutoff and crew evacuated the aircraft after securing the cabin.

1.2 INJURIES TO PERSONS

INJURIES	CREW	PASSENGERS	OTHERS
Fatal	Nil	Nil	Nil
Serious	Nil	Nil	Nil
Minor	Nil	Nil	Nil
None	02	06	Nil

1.3 DAMAGE TO AIRCRAFT

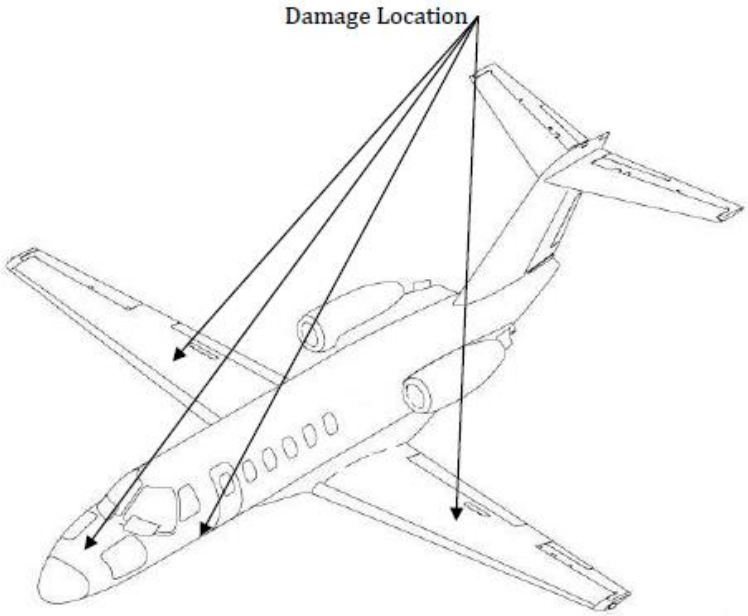

Fig1: Major Damage Locations on 525A-0373

Fig 2: Right Hand Side and Left Hand Side View of the Aircraft

The aircraft sustained substantial damage in the incident. Following damages were observed on the aircraft during damage assessment.

Damages observed on the aircraft fuselage: -

1) Drain pipes under fuselage (AC evaporator) broken.
2) Composite skin around landing lights cracked and damaged.
3) LH landing light broken.
4) Dent noticed on skin aft of LH landing light.
5) Nose radome damaged.
6) Weather Radar Antenna attachment bulkhead dented at bottom and found cracked at radome lock pins (Bottom LH)
7) LH & RH Pitot tube detached from its support tube assembly.
8) Multiple dents & cracks noticed on bottom skin both sides of Nose Landing Gear Wheel area.
9) Dent & Crack noticed on fuselage skin close to RH Pitot support tube assembly.
10) ATC transponder antenna damaged. Skin around antenna dented.
11) Heavy damage on the bottom skin and structure immediately after of pressure bulkhead. Dent noticed on bottom fuselage at F S 137 approx. Dent and Crack noticed on bottom fuselage at F S 145 approx. Crack length 140mm and width 50mm at the widest. Multiple scratches noticed on RH side bottom fuselage fairing from F S 203 to F S 286 approx. outer. Multiple scratches noticed on LH side bottom fuselage fairing from F S 203 to 286.

Fig 3: Nose Section

Damages observed on Landing gears:-

A. Nose Landing Gear

1) Nose wheel and landing gear fork has sheared from Oleo strut NLG wheel well area multiple dents, cracks and severe damage observed. NLG complete door assembly has damaged. NLG door link rods and hinges damage. NLG fork cracked and detached from Oleo Piston.
2) Shimmy Damper detached from its mount.
3) Bungee assembly – Nose Steering found damaged Upper torque link cracked at lower hinge end detached.
4) NLG actuator eye end sheared. Actuator attaching fork end on NLG damaged.
5) Lower steering joint support assembly detached from its all three attachment.
6) Nose Wheel tire deep cuts observed.

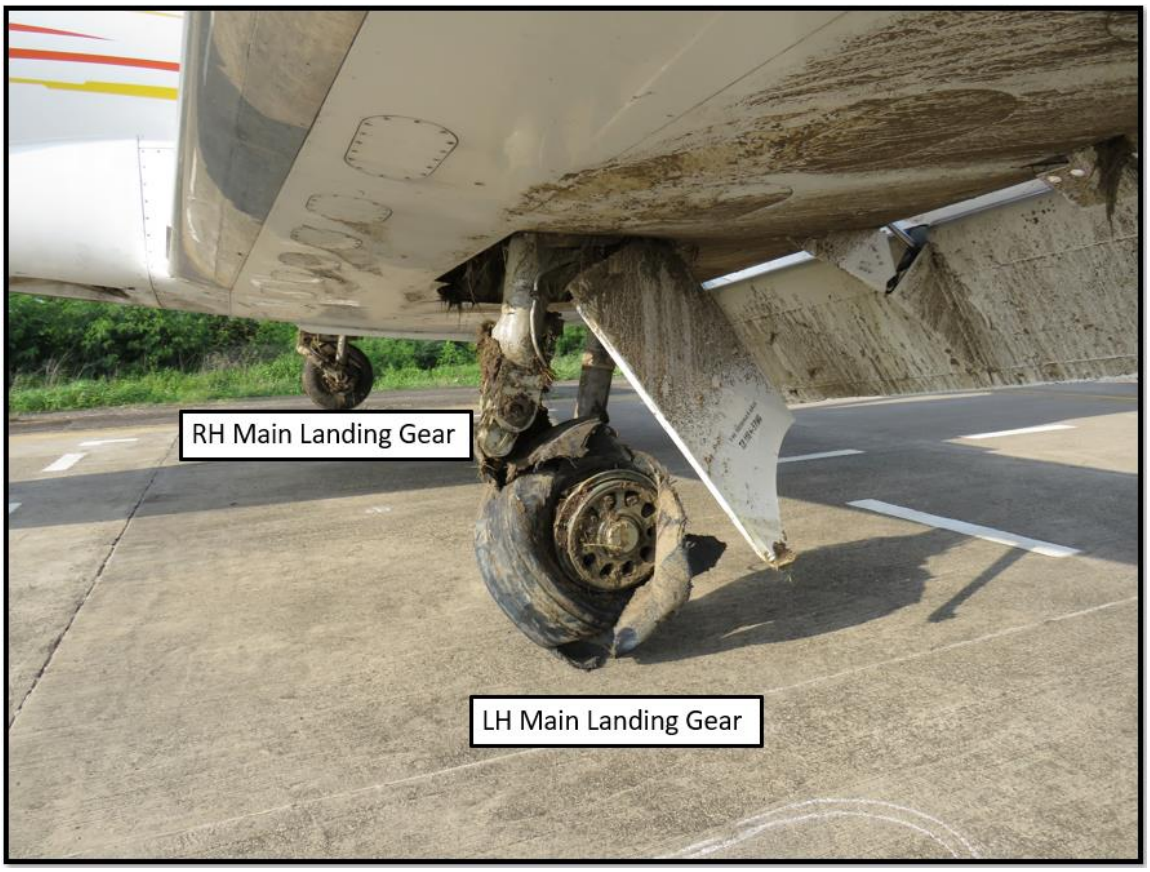

Fig 4: Side View of both MLG

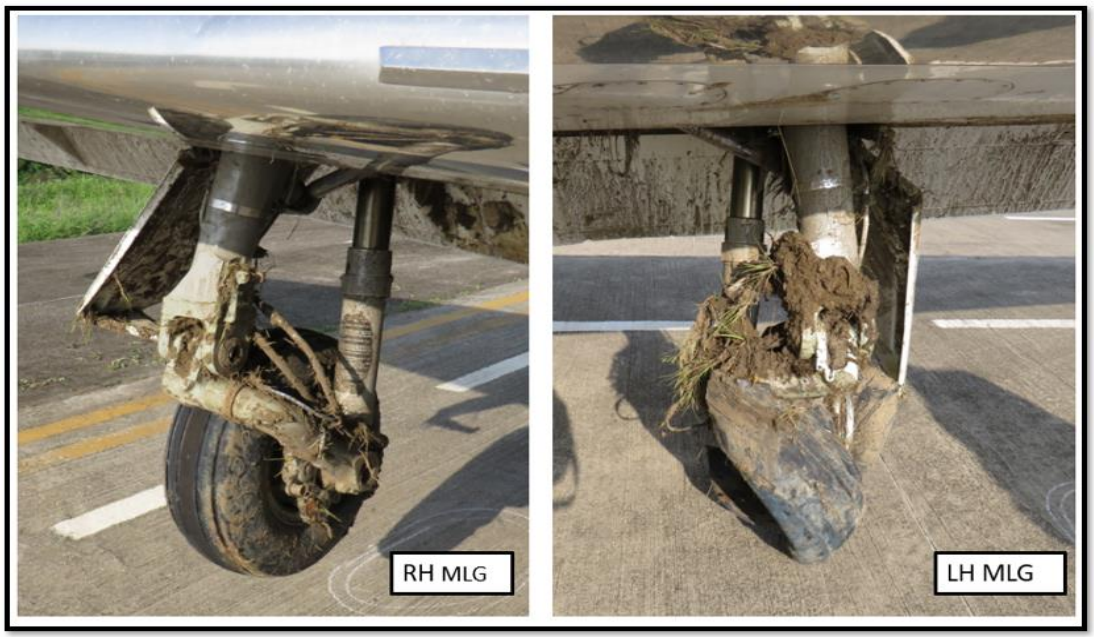

Fig 5: Front view of damaged MLG

B. LH Main Landing Gear

1) Main wheel tire deflated and disintegrated to many parts.
2) LH & RH landing gear doors damaged.
3) Door and MLG connecting rod end found broken.
4) Brackets on LH MLG supporting brake hydraulic and pneumatic lines found damaged.
5) Clamps supporting antiskid wire on LH MLG found damaged.
6) Small dent noticed in wheel well area.

C. RH Main Landing Gear

1) RH L/G door damaged by hitting ground.
2) Multiple deep cuts noticed on RH tire.

Damages observed on Engines:-

A. LH ENGINE

1) Nick Noticed on one stator blade. Score mark noticed on stator blade.
2) Minor rubbing damage observed on engine inlet casing.
3) Rub marks noticed on Leading Edge of Fan Rotor Blades.

B. RH ENGINE

1) Nick Noticed on two fan rotor blades.
2) Rub marks noticed on Leading Edge of Fan Rotor towards tip.

Fig 6: Right Side Wing

Damages observed on Wings:-

A. RH WING

1) RH wing leading edge cracked at wing root.
2) RH flap trailing edge damaged by hitting the ground.
3) Multiple scratched observed on leading edge b/w WS 30 and WS 112.
4) Multiple scratches observed on stall strip.
5) Multiple dents and holes noticed on bottom side of flap.
6) Dent noticed on inbound flap hinge bracket on flap assembly.
7) Dent noticed on RH wing fairing access panel no. 192 AL adjacent to RH Wing Leading Edge.

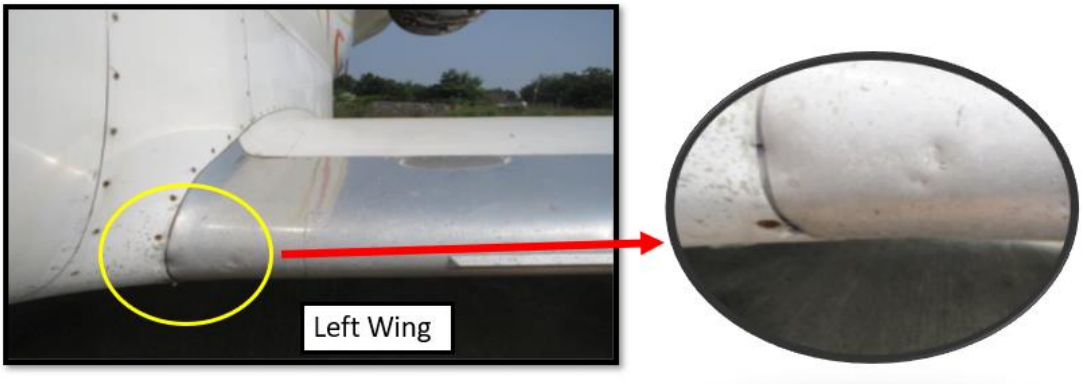

Fig 7: Left Side Wing

B. LH WING

1) Wing skin riveted joint opened on top of wing at WS 102 approx where flap actuator is attached to wing.
2) Dents noticed on Wing Leading Edge (Top & Bottom) between WS 32 to 48 Approx.
3) Severe scratches observed on stall strip.
4) Fuel leak noticed from the fuel tank access panel no. 621AB, 621BB, 621CB due to deformation.
5) Scratch noticed on fuel tank access panel no. 611BB 611AB and 612BB.
6) Multiple holes and dents noticed on bottom side of flap. Flap top side trailing edge damaged.
7) Inboard hinge bracket on the flap found bent and dented and cracked.

Further, Fuel tank Cap was missing for Starboard fuel wing tank.

1.4 OTHER DAMAGE

After the incident, two LH side runway edge lights L-39 & L-36 on runway 10 were found broken.

It was evident from the tyre marks that RWY edge light L-39 was broken by LH Main Landing Gear wheel and RWY edge light L-36 was broken by RH Main Landing Gear wheel.

Fig 8: Broken runway edge lights

1.5 PERSONNEL INFORMATION

1.5.1 Pilot – in – Command

Age	48 years 11 months
License	ATPL
Date of Issue	24/11/2016
Valid up to	23/11/2021
Category	Aeroplane Multi Engine
Date of Class I Med. Exam.	03/09/2019
Class I Medical valid up to	06/09/2020
FRTO License valid up to	01/08/2022
Endorsements as PIC	C152A, CE-525, Pushpak MK1 Swati, SR22
Total flying experience	5741: 00 Hrs
Total flying experience on type	3222:45 Hrs
Last Flown on type	CE-525
Total flying experience during last 1 year	394:15 Hrs
Total flying experience during last 6 Months	223:25 Hrs
Total flying experience during last 30 days	21:20 Hrs
Total flying experience during last 07 Days	01:10 Hrs
Total flying experience during last 24 Hours	01:10 Hrs
Rest period before flight	Adequate

1.5.2 Co-Pilot

Age	30 years 2 months
License	CPL
Date of Issue	13/01/2019 (Renewal)
Valid up to	12/01/2024
Category	Aeroplane Multi Engine Land
Date of Class I Med. Exam.	03/03/2019

Class I Medical Valid up to	06/03/2020
Date of issue FRTOL License	30/03/2017
FRTO License Valid up to	09/06/2069
Endorsements as PIC	C-152, BE-76
Total flying experience	741:55 Hrs
Total flying experience on type	487:40 Hrs
Last Flown on type	CE-525
Total flying experience during last 1 year	414:55 Hrs
Total flying experience in last 6 Months	240:25 Hrs
Total flying experience during last 30 days	22:35 Hrs
Total flying experience during last 07 Days	02:25 Hrs
Total flying experience during last 24 Hours	01:10 Hrs
Rest period before flight	Adequate

Both pilots were neither involved in any serious incident nor an accident in the past as per the information made available by the operator. Both crew were current in all trainings and had adequate rest as per the Flight Duty Time Limitations (FDTL) requirement prior to operating the incident flight.

Both, PIC and FO had undergone Monsoon Operations training on 26th Feb 2019 and 3rd May 2019 respectively.

1.6 AIRCRAFT INFORMATION

1.6.1 Aircraft General Information

The CJ2+ is a twin-turbofan, pressurized, low-wing monoplane with T-tail configuration. On pylons extending from the rear fuselage are two Williams-Rolls FJ44- 3A-24 turbofan engines. The aircraft has retractable tricycle landing gear.

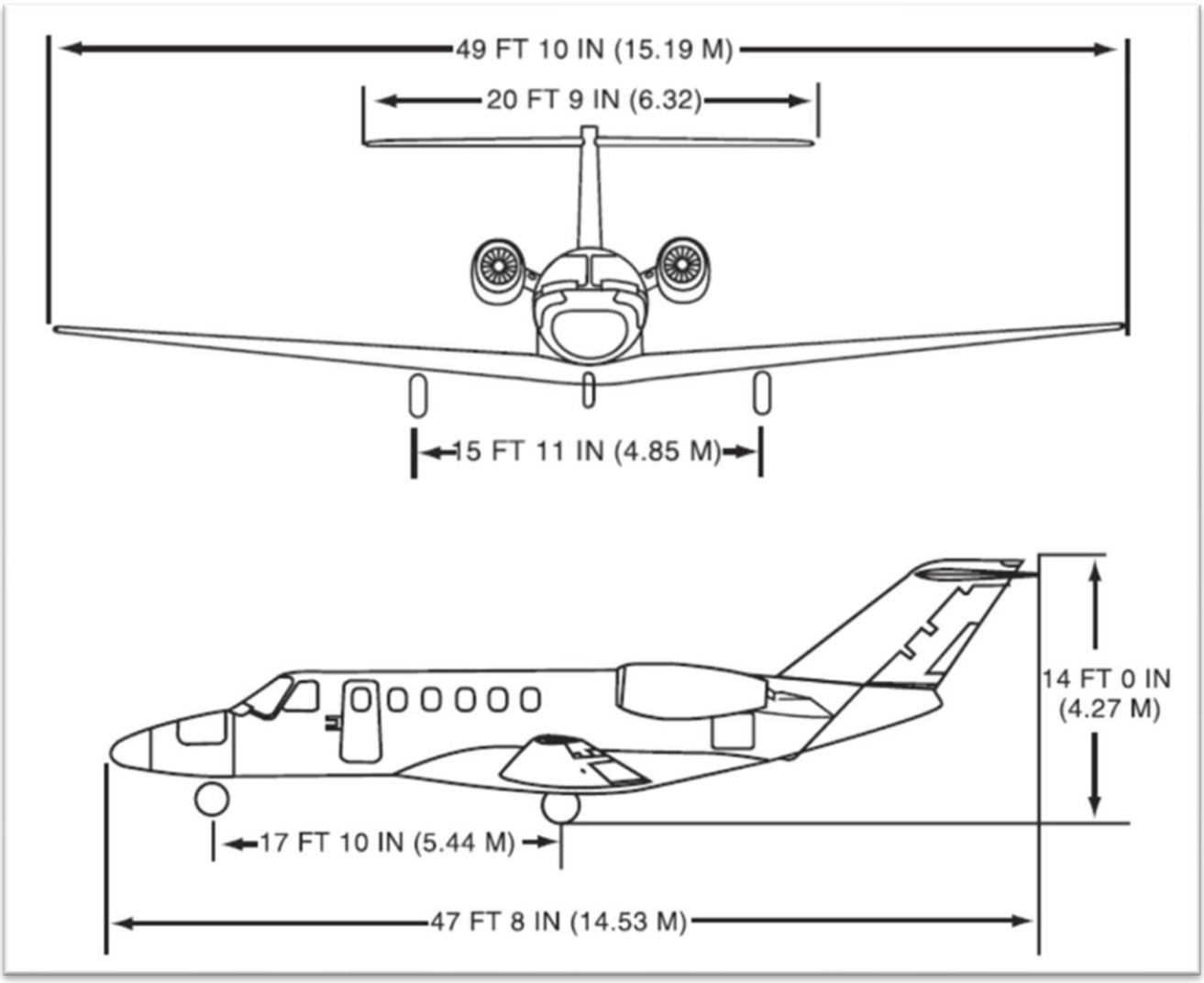

Fig 9: Three-view Drawing

The nose section is an unpressurized area containing the avionics compartment, an equipment area, and a baggage storage area (400-pound capacity). The storage compartment has two swing-up doors.

A pneumatic actuator on each door holds the door in the full open position until the door is closed. The windshield alcohol and brake reservoirs, the power brake accumulator, and a high-pressure nitrogen bottle are all behind the right aft bulkhead of the nose storage compartment.

Two complete crew stations are provided with dual controls, including control columns, brakes, and adjustable rudder pedals with fore, mid, and aft detents. There are two fully adjustable seats with five-point seat belts and shoulder harnesses.

1.6.2 Aircraft Specific and Technical Information

Aircraft model	Cessna Citation 525A – CJ2+
Aircraft MSN No.	525A – 0373
Year of manufacture	2007
Aircraft owner	M/s Cessna Finance Corporation
C of R	3700/2 valid up to 10th Sep 2020
C of A	4009
Category	Complex Motor
C of A validity	Valid
A R C issued on	28th January 2019
ARC valid up to	28th January 2020
Aircraft empty weight	3602.39 Kgs
Maximum takeoff weight	5670 Kgs
Date of aircraft weighment	24th January 2018
Max usable fuel	1797 Kgs
Max payload with full fuel	100.61 Kgs
Empty weight CG	7206.020162 mm
Next weighing due	23rd January 2023
Total aircraft hours	3593: 01 Hrs
Last major inspection	01.07.2019 (72 months inspection)
Repairs carried out after last major inspection till date of incidence	Nil
Engine type	Turbofan (Williams FJ44-3A-24)
Date of manufacture LH	04th August 2007
Engine Sl. No. LH	216151
Last major inspection (LH)	Check – 1 (10.04.2019)
List of repairs carried out after last major inspection till date of incidence	Nil

Total engine hours/cycles LH	3593: 01 Hrs / 3586
Date of manufacture RH	08th August 2007
Engine sl. No. RH	216152
Last major inspection (RH)	Check – 1 (10.04.2019)
Repairs carried out after last major inspection till date of incidence	Nil
Total engine hours/cycles RH	3593: 01 Hrs / 3586
Aeromobile license	Valid up to 10th September 2020

This Aircraft was operated under Non-Scheduled Air Operator Permit No 05/1997 initially issued on 07.12.1997 and renewed on 03.05.2019. The permit was valid up to 06.11.2023.

The aircraft was last weighed on 24.01.2018 at TAAL, Hosur and the weight schedule was prepared and duly approved by the office of Deputy Director of General, (DGCA) Bangalore. As per the approved weight schedule, the Empty weight of the aircraft is 3602.39 Kg and the Maximum take-off weight of the aircraft is 5670 Kg. Maximum Usable fuel Quantity is 1797 Kg. Maximum payload with fuel tanks full is 100.61 Kg. Empty weight CG is 7.2060 m aft of datum.

All concerned Airworthiness Directives, mandatory Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engines had been complied with as on the date of event. As per aircraft journey log book entries, there was no defect reported on the aircraft and no MEL was invoked before incident flight.

1.6.3 Rain Repellent System

The rain removal system uses the normal bleed-air anti-ice system for rain removal, with rain doors to deflect raindrops over each windshield in heavy rain.

The WINDSHIELD-BLEED switch and two WINDSHIELD BLEED AIR knobs control bleed air to the windshield.

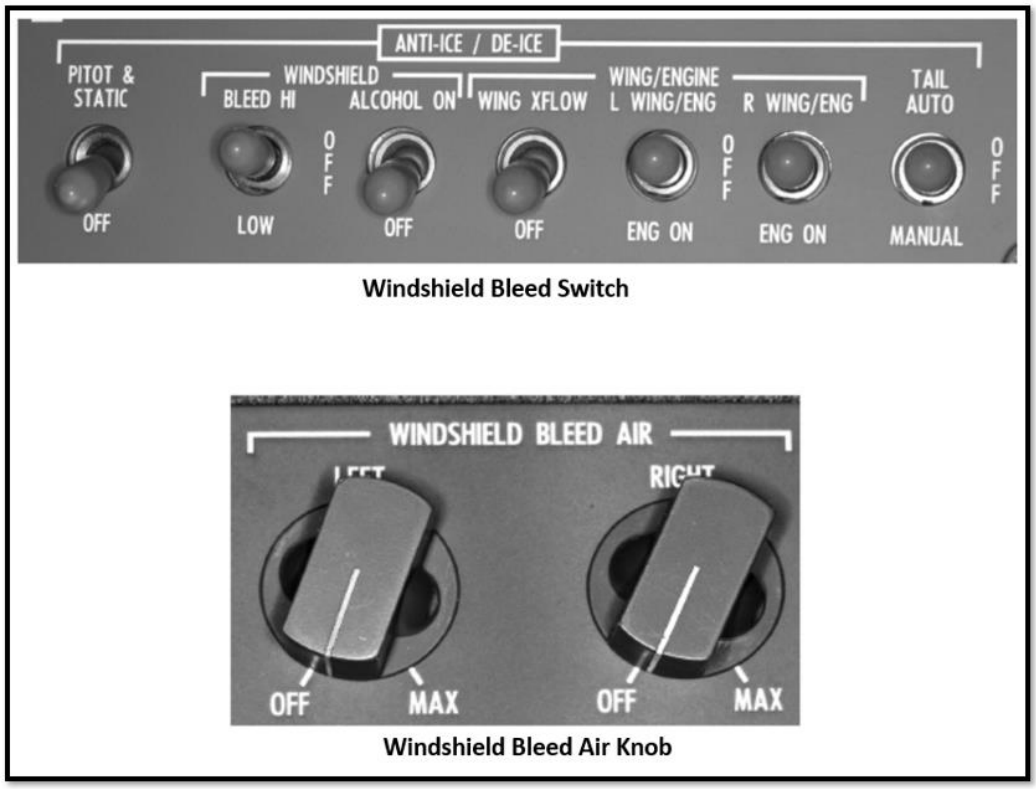

Fig 10: Windshield Switch and Knob

I. WINDSHIELD BLEED AIR

Windshield bleed air also provides rain removal during low airspeed flight. When rain removal is desired, pull up the rain removal handle and position the WINDSHIELD-BLEED HI-LOW switch to the LOW position. Rotate the WINDSHIELD BLEED AIR knobs to the MAX position.

II. RAIN DOORS

The CJ2+ rain removal system includes rain doors that the pilot can open or close to provide deflected airflow over each windshield.

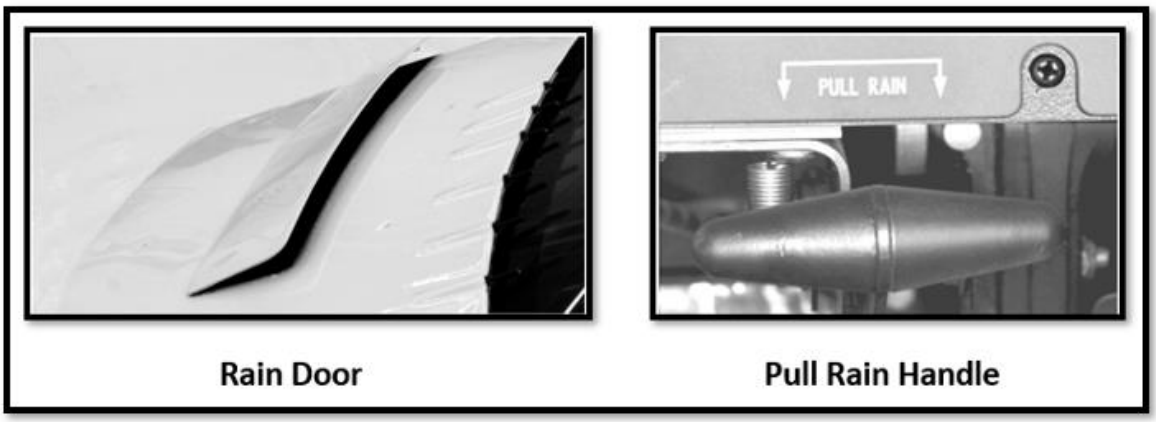

Fig 11: Rain Door and Rain Handle

SYSTEM OPERATION

The doors operate manually by pulling the PULL RAIN handle under the WINDSHIELD BLEED AIR knobs on the pilot panel.

For rain removal, pull up the PULL RAIN handle, rotate the WINDSHIELD BLEED AIR knobs on the pilot control panel to the MAX position, and position the WINDSHIELD- BLEED HI-LOW switch to LOW. Rain door opening is increasingly difficult at higher speeds and if the windshield bleed air is already flowing out of the nozzles. To increase airflow to the wind- shield during periods of low-power settings (e.g. during landing flare), rotate the copilot WINDSHIELD-BLEED AIR-RIGHT knob to the OFF position. This diverts all available bleed air to the pilot's windshield. In addition, the use of an approved rain repellent agent applied to the windshield before flight greatly enhances the effectiveness of the rain removal system.

1.7 METEOROLOGICAL INFORMATION

The incident occurred at 1826 UTC. The METAR of 1830 UTC was intimated to the crew by the ATC. As per the local Met office, following met conditions existed, between 1730 UTC – 1900 UTC at Nanded airport:

Time (UTC)	**Winds (Direction/ Speed)**	**Visibility (m)**	**Clouds**	**Temp (°C)**	**Dew Point (°C)**	**QFE hPa**	**QNH hPa**	**TREND**
1730	280/05	3000	FEW 1800 FT SCT 2500 FT BKN 8000 FT	24	23	0966	1010	No SIG
1800	270/03	3000	FEW 1800 FT SCT 2500 FT BKN 8000 FT	23	23	0966	1010	No SIG
1830	250/09	3000	FEW 1800 FT SCT 2500 FT BKN 8000 FT	23	23	0965	1009	No SIG
1900	260/06	3000	FEW 1800 FT SCT 2500 FT BKN 8000 FT	23	23	0965	1009	No SIG

Further, CVR tape transcript revealed that the wind information was updated three times by Nanded ATC to the crew. The last transmission was at 1825 UTC at the

time of according landing clearance, wherein crew was informed " wind 250°/10 knots".

No significant trend was reflected in the Met report. However, heavy precipitation was observed by the crew after touchdown at Nanded airport.

1.8 AIDS TO NAVIGATION

Navigation aids available at Nanded airport are PAPI and VOR/DME for Non-Precision approach procedures at both ends of runway.

The last routine VOR/DME inspection was carried out on 10.07.2019 and the facility was certified for unrestricted use.

The last routine PAPI-10 & PAPI-28 inspections were carried out on 10.07.2019 and the facilities were certified as Useable.

1.9 COMMUNICATIONS

The aircraft contacted Nanded ATC at 1757 UTC and remained in positive contact with the Nanded ATC on frequency 118.75 MHz.

Following are the salient observations on Nanded ATC Tape transcript after aircraft came in contact:

TIME (UTC) HH:MM: SS	TRANSMITTED BY	TRANSMISSION/COMMUNICATION
17:57:01	VTBRT	NANDED VICTOR TANGO BRAVO ROMEO TANGO.
17:57:05	TWR	VICTOR TANGO BRAVO ROMEO TANGO NANDED TOWER.
17:57:09	VTBRT	GOOD EVENING SIR. AT LEVEL TWO FIVE ZERO OUR ETD WILL BE ONE EIGHT ONE NINER AND REQUESTING WEATHER IN NANDED.
17:57:22	TWR	VICTOR ROMEO TANGO METAR AT ONE SEVEN THREE ZERO WIND TWO ZERO DEGREES ZERO FIVE KNOTS. VISIBILITY THREE THOUSAND METERS. WEATHER RAIN. CLOUD FEW ONE THOUSAND EIGHT HUNDRED FEET, SCATTERED TWO THOUSAND FIVE HUNDRED FEET, BROKEN EIGHT THOUNSAND FEET. TEMPERATURE TWO FOUR, DEW POINT TWO THREE, QNH ONE ZERO ONE ZERO NO SIG.
17:58:08	VTBRT	WE ARE NOW ONE FOUR EIGHT NAUTICAL MILES VICTOR ROMEO TANGO.
17:58:25	VTBRT	AND REQUESTING RUNWAY ONE ZERO SIR IF POSSIBLE.

17:58:28	TWR	VICTOR ROMEO TANGO APPROACH LIGHTING FOR RUNWAY ONE ZERO IS UNSERVICEABLE.
18:07:33	VTBRT	NANDED RELEASED BY MUMBAI WITH YOU NOW.
18:07:40	TWR	ROGER.
18:19:24	TWR	VICTOR ROMEO TANGO CLEARED FOR VOR-DME APPROACH RUNWAY TWO EIGHT. REPORTING LEAVING NOVEMBER DELTA DELTA.
18:19:30	VTBRT	SIR WE HAD REQUESTED FOR RUNWAY ONE ZERO.
18:19:35	TWR	BUT APPROACH LIGHTING IS UNSERVICEAVBLE. CONFIRM WILL COME FOR ONE ZERO.
18:19:40	VTBRT	AFFIRM SO VICTOR ROMEO TANGO.
18:19:43	TWR	ROGER REPORT ESTABLISHED ON FINAL APPROACH TRACK RUNWAY ONE ZERO.
18:19:47	VTBRT	FINAL FOR ONE ZERO VICTOR ROMEO TANGO.
18:23:16	VTBRT	CONFIRM WINDS.
18:23:21	TWR	TWO FIVE ZERO DEGREES ZERO NINER KNOTS.
18:23:23	VTBRT	TWO FIVE ZERO DEGREES ZERO NINER KNOTS VICTOR ROMEO TANGO.
18:25:13	VTBRT	REPORTING FINAL APPROACH TRACK VICTOR ROMEO TANGO.
18:25:18	TWR	VICTOR ROMEO TANGO REPORT FINAL APPROACH FIX FOR RUNWAY ONE ZERO.
18:25:22	VTBRT	COPIED.
18:25:25	VTBRT	WE REPORTING NOW VICTOR ROMEO TANGO.
18:25:29	TWR	VICTOR ROMEO TANGO RUNWAY ONE ZERO CLEAR TO LAND WIND TWO FIVE ZERO DEGREES ONE ZERO KNOTS.
18:25:33	VTBRT	TWO FIVE ZERO DEGREES ONE ZERO KNOTS CLEAR TO LAND RUNWAY ONE ZERO VICTOR ROMEO TANGO.
18:25:37	VTBRT	REQUESTING TO INCREASE THE INTENSITY.
18:25:41	TWR	CONFIRM INCREASE THE INTENSITY.
18:25:42	VTBRT	AFFIRM.
18:25:43	TWR	ROGER.
18:27:15	VTBRT	TOWER WE HAVE THAT RUNWAY SKID.
18:27:21	VTBRT	WE HAVE THE RUNWAY SKID.
18:27:24	TWR	ROGER.
18:28:16	TWR	VICTOR ROMEO TANGO REPORT POSITION.

1.10 AERODROME INFORMATION

Shri Guru Gobind Singh Ji Airport, Nanded is owned by Maharashtra Industrial Development Corporation (MIDC), however, it was handed over to Nanded Airport Private Limited (NAPL) on lease on 27th Oct, 2009 for 95 years with rights to operate, maintain and develop the Aerodrome. The IATA location Identifier code is NDC and ICAO location Indicator code is VAND. The airport is authorized for VFR/IFR

operations. It is available round the clock to cater to VIP/VVIP flights as per requirements.

The elevation AMSL of airport is 378.35 m (1241 ft). The Airport Reference point coordinates are 19° 10’ 51.739” N and 077° 19’ 21.170” E. Rescue & Fire Fighting Services of Category VI is made available during ATC watch hours at Nanded airport. The Aerodrome is capable of Category VII, however, Category VI is maintained based on the type of Aircraft operating currently to the Airport.

Aerodrome Dimensions and related Information

Rwy No.	Elevation (m)	TORA (M)	TODA (M)	ASDA (M)	LDA (M)	RESA (M)	THR Co-ordinates
10	378.26	2300	2300	2300	2300	240 X 90	19°10’57.850” N 077°18’53.00” E
28	372.38	2300	2300	2300	2300	240 X 90	19°10’48.427” N 077°20’11.139” E

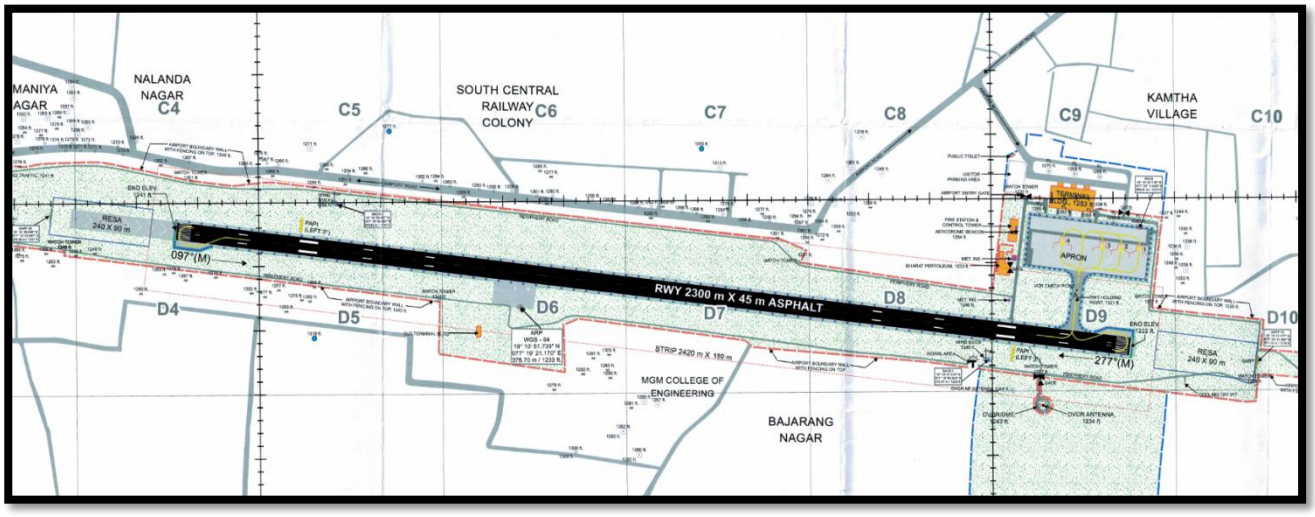

Fig 12: Grid Map of Nanded Aerodrome

Airstrip dimension and other relevant information

a) Runway Details	Dimensions/Particulars
1. True Bearing 10/28	96.47 º/276.47 º
2. Designation Number	10 / 28
3. Length	2300 m

4. Width	45 m
5. Displaced Threshold location	NA
6. Surface Type	TARMAC
7. Type of Runway	IFR/VFR, Non-Precision Approach
8. Existence of an obstacle free zone	60 m from Centreline of Runway
9. Pavement Surface Type and Bearing Strength through ACN-PCN method	Runway – PCN 60 F/A/W/T
Runway Strip Details	
1. Length	2420 m
2. Width	150 m
3. Surface Type	Graded soil
4. Stopway	Not Provided
Clearway	
1. RWY 10 End	Not Provided
2. RWY 28 End	Not Provided
Visual Aids for Approach Procedures	
1. Approach Lighting Type	Simple Approach Lights at RWY 10 & 28
2. Visual Approach Slope Indicator System	PAPI provided on RWY 10 & RWY 28, Glide Angle 3º
3. Markings	
Runway	Centreline: 0.45 x 30 m stripes in water base white paint with gap of 20 m. Runway side stripe: Provided 0.9 m Thresholds: Threshold stripes 1.80 m x 30 m, 12 Nos. with a gap of 1.80 m between them, double spacing at centre of RWY

4. Lighting	
Runway	Edge Lights, Inset Centre Line lights, Turning pad lights and Threshold lights are provided as per ICAO specification
Taxiway	Taxiway edge lights are provided as per ICAO specification
Apron	Apron edge lights are provided as per ICAO specification

On 11.09.2019, last RWY inspection of Nanded airport before incident was carried out at 1547 UTC by aerodrome operational jeep. It was reported "runway clear and fit for operations". All associated RWY lights and Aerodrome beacon were serviceable except SALS (Simple Approach Lighting System) of RWY 10 and the runway centre light.

Runway surface friction test of Nanded Airport was last performed on 09.02.2019 and all values of friction co-efficient for entire runway were within the prescribed limits.

1.11 FLIGHT RECORDERS

The aircraft was equipped with Solid State CVR and the retrieved recorder unit did not show any sign of damage. The CVR unit make is "L3 Communication" bearing part no. 2100-1020-02, serial no. 000474256 with total 02 hrs 04 minutes & 14 seconds capacity of recording. After the incident, CVR was downloaded and analysed.

Following are the salient observations from CVR of incident aircraft :-

Time (UTC)	Transmitted by	Description
17:57:09	P_2	Good evening sir at level 250 our ETD 1819 and requesting weather in Nanded.
17:57:22	N.T	V-RT METAR at 1730 Wind 280º/05 knots Visibility 3000 m Weather Rain Cloud Few at 1800' Scatter at 2500' Broken 8000' Temp 24 Dew 23 QNH 1010 NO sig.
	P_1	Waha pe abhi le lena apna 28.. 10 le lena. Rwy10

17:58:08	P_2	We are now 148NM V-RT
17:58:25	P_2	And requesting Rwy 10 Sir, if possible
17:58:28	N.T.	V-RT approach lighting for Rwy 10 is unserviceable
17:58:33	P_2	Copied Sir V-RT
17:59:42	P_1	Cloud base ka kya bata raha hai ?
	P_2	Cloud bas Broken at 8000' Scatter at 2500' Few at 1800'
	P_1	Ok… Few at ?
	P_2	1800'
17:59:55	P_1	1800'
18:00:24	P1	Abhi 10 de diya na usne?
	P2	Haan 10 de diya
	P_1	Defog System High
	P_2	High
	P_1	Koi nahi rehane dijiye
18:10:46	P_2	Level 180 and below Sir
	P_1	Kya hai?
	P_2	Defog system off 180 and below
	P_1	Kya
	P_2	180 and below defog off
18:11:15	P_1	Okay i am taking slightly left, thoda patch hai
	P_2	Okay
	P_1	Rain ka…
	P_1	VNAV Mai hi chal na padega abhi
	P_1	Kitna Tail wind, kitna aa raha hai?
	P_2	Tailwind nahi hai Sir, Head wind 3kt aa Raha hai.
18:13:43	P1	Headwind 3kts aa raha hai, phir tho ye hi karna padega, Aur dusare side se… kitna ayega '3'? Wohi 3kt Tailwind ayega.
	P1	Approach mai baitha Huwa hai… Hu…?
18:19:05	P2	Reporting 25 Nm VTBRT.
18:19:24	TW	VRT cleared for VOR DME App Rwy 28 report leaving NDD.
18:19:30	P2	Sir we had requested for Rwy 10.
18:19:35	N.T	Approach lighting is unserviceable confirm you will come for 10?
18:19:40	P1	That's Affirm
	P2	That's Affirm Sir VT-BRT
18:19:43	N.T	Rodger Report establish of final Approach Track for Rwy 10.
	P2	Will Report final for Rwy10 V-RT
	P1	Agar Turbulence Jyada Hoga to will take Heading 090
	P2	Okay Sir

	P1	When will hit this one if it comfortable, ok otherwise will go for Heading 090 and will use other way round. Abhi kitna clear kiya ?
	P1	Abhi visual hogaya 'VM'
	P1	V..M…
	P1	Confirm V…M…
18:21:15	P2	Yes Sir I confirm my side I have Terrain insight
	P1	Putting that Approach, NAV, V NAV Thik hai Why this is showing so much of dark?
	P1	Distance to go?
	P2	Distance to go is 16 miles and transition 65, 1010
	P1	1010 Confirm VM.?
	P2	VM..Sir
	P1	Runway wet hoga to we have to prepare for Emergency Break also
	P2	Okay We have Available 7500 feet
	P1	Aapke hissab se winds kitna de raha hai, wind kitna bata raha hai
	P2	Winds are 030/04 nahi 07kts Sir
	P1	3kts kaise aa sakta hai, ye to galat dala hai apne.. apne galat dala hai, take the winds.
18:23:16	P1	Confirm winds VT-BRT
18:23:21	N.T	250/09 kts V-RT
		Altitude Alert
		2.5…?
	P2	250/09 kts, Tailwind aaraha hai Sir
	P1	Chalo… We are 8 kts Tailwind but we have the Rwy 7500' that is more than enough. So we can make out that one
	P1	Abhi jo patch aya hua hai wo saare ka sara Airport ke upar hi hai…..Sh.….
18:25:13	P2	Reporting Final Approach Track VRT
18:25:18	N.T	VRT Report Final Approach fix for Rwy 10
18:25:25	P2	We are reporting now V-RT
18:25:29	N.T	V-RT Rwy 10 clear to land 250/10
	P2	250/10 Clear to land Runway 10 V-RT
18:25:37	P2	Requesting to increase the intensity
18:25:41	N.T	Confirm increase the intensity
18:25:42	P2	Affirm
18:25:43	N.T	Roger
18:26:10	P1	Check speed
	P2	Speed is Now 125 Sir
	P2	130

	P2	124
	P2	125
18:26:23		Touch down, Sound at Nanded Runway
	P2	Thoda Right le lenge
	P2	Bass Bass
	P2	Right , Right
	P1	Vacate vacate immediately
18:27:15	P1	Tower, we have that Runway skid

1.12 WRECKAGE AND IMPACT INFORMATION

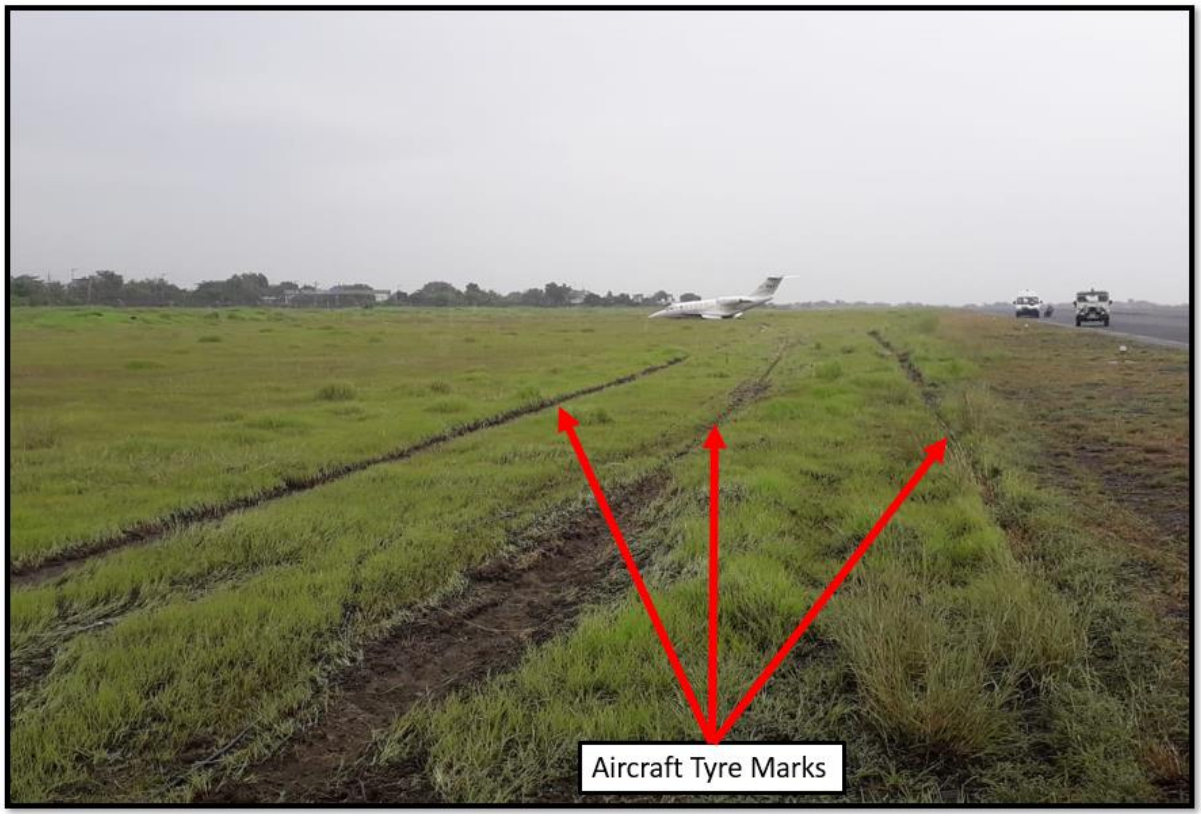

Fig 13: Aircraft Tyres marks on soft ground

The aircraft touched down on left side of runway centreline at approximately 300 m from threshold of runway 10. The aircraft started veering off to the left immediately after it touched down. PM observed that the aircraft was drifting towards left and as a corrective measure gave the call “Right Right”. However, aircraft continued to veer off to the left and after travelling for approximately 400 m, the left main wheel tyre left the paved surface and went into soft ground. After travelling 90 m further, aircraft veered further to left. The left wheel tyre mark was measured at a maximum distance of 3 feet 5 inches from the runway edge. Thereafter, PIC had tried

to bring the aircraft back on the paved surface which was evident from the left main tyre marking wherein it moved towards the right and tyre marks were found at 1 foot 5 inches from the runway edge. In-between due to impact between runway edge light and the left wheel, the left tyre had burst. Consequently, crew failed to bring back the aircraft left wheel on the runway. The aircraft became almost uncontrollable and continued veering further towards left. Aircraft exited the runway at about 1134 m from the threshold of runway 10, and came to rest at approx 1300 m from the threshold of runway 10, facing towards north. The track followed by the aircraft is shown in the figure 13 below:-

Fig 14: Aircraft Final Resting Position

1.13 MEDICAL AND PATHOLOGICAL INFORMATION

The crew had undergone preflight breath analyser test at Mumbai airport on 11.09.2019, prior to flight as required by the prevalent CAR Section 5 Series F, Part III. The test was satisfactory.

On 12.09.2019, after the incident, both crew again underwent post flight breath analyser test at Nanded airport, and the result was again satisfactory.

1.14 FIRE

There was no fire reported on the aircraft, pre or post incident.

1.15 SURVIVAL ASPECTS

Aircraft came to a halt after travelling a distance of 1300 m from runway 10 threshold and 26 m from runway edge. Immediately after runway excursion, PIC instructed FO to evacuate all passengers. Before CFT reached on site, all passengers had deplaned from the main door. The aircraft sustained damages beyond economical repair during the incident. However, none of the occupants received any injury. The incident was survivable.

1.16 TESTS AND RESEARCH

Nil

1.17 ORGANIZATIONAL AND MANAGEMENT INFORMATION

M/s Taneja Aerospace and Aviation Ltd. is a Non-Scheduled Air transport operator engaged in charter operations with its head office at Bangalore. The operator is having Non- Scheduled Operating Permit (NSOP) No. 05/1997 and the same was valid on the day of incident. The operator has 01 Cessna Citation 525A-CJ2+ (VT-BRT) registered in its name as per AOP . Being a non-scheduled operator, the area of operations are based on "as & when required basis" all over the country and neighbouring countries. In addition, the operator has in-house CAR 145 maintenance approval and maintains two other aircraft belonging to other Non-Scheduled operators.

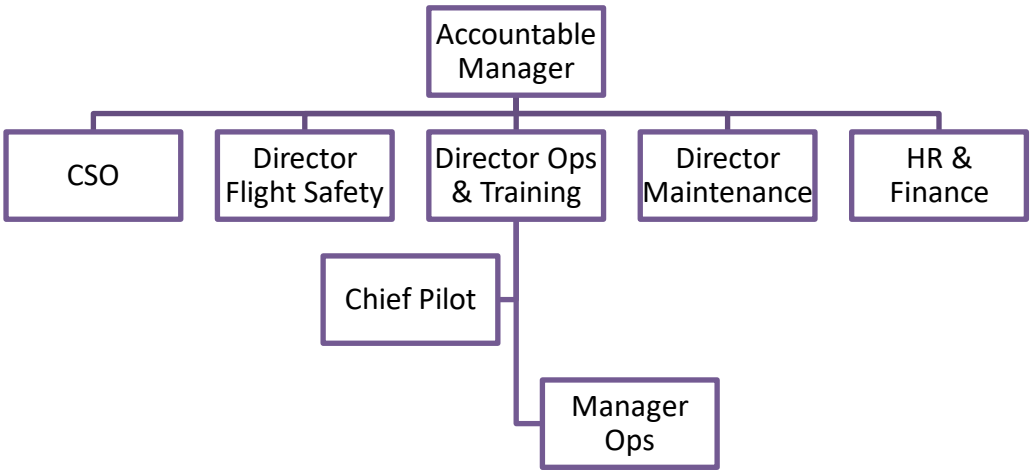

Fig 15: Organizational Chart of the operator

As per the DGCA approved Operations Manual, the Accountable Manager has the overall accountability to manage the affairs of the company. The Accountable Manager is assisted by CSO, Director Flight Safety, Director Ops & Training, Director Maintenance and HR & Finance. The Director Ops & Training is assisted by Chief Pilot and Manager (Operations).

1.18 ADDITIONAL INFORMATION

1.18.1 Boroscopic Inspection

Internal condition of both jet engines fitted on the aircraft was assessed through Boroscopic inspection carried out as per OEM Maintenance Manual procedure for the following engine modules:

i. IP and HP Compressors

ii. Combustor

iii. HP nozzle

iv. HP &LP Turbines

The inspection reflected that internal condition of the engines was satisfactory except for ingestion of grass and grime. Furthermore, Engine Fan Shroud abradable, few leading edges of fan blades and stator vanes required a little dressing up, although the observations were minor in nature.

The overall physical health of both engines was found normal.

1.18.2 Aerodrome Operational Area

On 12.09.2019, grass of noteworthy height mainly covering few LH side of runway edge lights on RWY 10 was observed.

Fig 16: Grass covering runway edge lights

As per the operator's approved Aerodrome Manual, guidelines on removal of wild vegetation in Movement Area is as follows:-

"Grass Cutting - Runway basic strip and Glide Path areas are regularly kept clear of grass throughout the year as and when required by using tractor and available equipment, under the supervision of Head Airside Operations. The grass in other areas, as well as the grass in areas where the equipment cannot reach are removed manually with the help of maintenance contracts."

1.18.3 Centre lights

During scrutiny of checklists for runway inspection, runway centre lights installed on runway 28/10 were found as reported unserviceable on the day of incident. In addition to this, Aerodrome operator's inspection team observed runway centre lights unserviceable on preceding days too.

Last one week inspection data was sought from the aerodrome operator and following was the observation of inspection team who carried out the runway inspection: -

Srl No.	Date of Inspection	Centre light Condition	Remarks
1.	06.09.2019	Unserviceable	Blank
2.	07.09.2019	Serviceable	02 U/S
3.	08.09.2019	Serviceable	42 U/S
4.	09.09.2019	Serviceable	42 U/S
5.	10.09.2019	Unserviceable	02 U/S
6.	11.09.2019	Unserviceable	Blank

As per the checklist made available to the investigation team, inspections were carried out by the aerodrome operator's inspection team twice on 11.09.2019. For the first inspection, team's entry time mentioned in the checklist is 0717 (UTC) and exit time 0733 (UTC). During second inspection, entry time mentioned in the checklist is 1540 (UTC) and exit time 1550 (UTC).

However, for all other completed inspections, entry time as well as exit time was not mentioned. In addition to this, most of the columns were found blank. At two occasions, during inspection, runway centre lights were mentioned serviceable and in remarks, 42 lights were marked unserviceable.

1.18.4 Challenges During Night Flying

Part A, Chapter 29 of Operations Manual of M/s TAAL, outlines the challenges crew could encounter while operating flight during night and in heavy weather. And some of the challenges mentioned in the Operation Manual are as follows:

a. Significantly reduced availability of visual clues

b. Optical illusions, which can hamper situational awareness.

c. Onset of Fatigue, especially after midnight

ii. Crew Workload During Night and IMC Instrument Approach and Landing Operations:

The low decision heights associated with approaches require an instantaneous

decision on visibility, alignment, etc., by the Pilot Flying.

As per the company policy, one Pilot will monitor the flight instruments continuously during approach for out of parameter excursion and when carrying out an instrument approach in weather conditions near to or at minimums,

the Pilot Not Flying will remain "Head down" and monitor the flight instruments to touch down and through the missed approach procedure. The Pilot Flying shall remain on instrument up to 100 feet above minima but start adjusting his/her scan for outside visual clues below 500 ft.

As per the company Ops Manual, the following is a detailed explanation of the Monitored Approach and the Crew Task Sharing **:**

- At 1000' above airport elevation (barometric altitude) the PM will again cross check the flight instruments and announce 1000' above field elevation, instruments checked (or nature of discrepancy) and calls actual speed, rate of descent.
- At 500' above airfield elevation the PM will call "500' above airfield,- Speed, ---ROD---.
- The PM will also call deviations of plus 5 minus 0 knots from the target approach speed and any rate of descend in excess of 1000 fpm. From 500' to minimums the PF will proportionately increase his/her scan to include outside visual cues as DA/ MDA is approached.
- The PM will call 100' above DA/ MDA by announcing "100', thereafter, PF will increase his/her scan pattern from outside visual cues and should have his/her decision formulated at decision altitude.
- The PF shall loudly announce his/her decision-either "Landing or Going around". If there is no call by PF at DA the PM shall initiate a missed approach.
- The PF will execute a missed approach should visual cues not be seen or not confirm the alignment of the aircraft with the runway. During missed approach PM shall cross check attitude on standby horizon.

- The PM shall at all times remain on instruments and call out air speed deviations, unusual attitude, etc. to touch down or through the missed approach and also appropriate air speed during the roll out.

1.18.5 Visual Illusions

In Part A, Chapter 29, Para 29.4 of Operations Manual, factors for visual illusion and its effects on flight are mentioned thereof.

It has been quoted in the manual that mostly pilots suffer from visual illusions of one kind or another when flying, the majority of the illusions will probably be passed undetected unless they lead to noticeable events. It is, therefore, important to recognize that crew are vulnerable to visual illusions.

As per manual, some of the contributing factors which may lead to visual illusion are as follows:

- optical characteristics of windshields;
- rain on the windshield;
- variations in runway lighting systems;

The Visual clues by which a pilot makes judgements about the landing approach are largely removed if the approach is over water, over snow or other such featureless terrain or carried out at night.

In addition to this, bright light is also considered as a factor for visual illusion at the time of approach.

Illusions due to Visibility Restrictions

As per the Operations Manual, moisture on the windshield interferes with visibility and may cause any type of ‘off glide path'" illusion. Light rays will retract (bend) as they pass through the layer of moisture on the windshield. Depending on the particular airplane and pattern of ripples across the windshield, aircraft appear to be above or below the glide path or, left or right of center line. This can be as much as a 200 feet error at one mile from the runway which, when combined with

the effect mentioned above could result in touchdown three to five thousand feet short of the runway.

1.18.6 Aircraft Performance

Aircraft Flight Manual clearly states about the procedures to be followed to feed the data in FMS, calculations on adverse runway landing performance and wind limitations of the aircraft.

i. Takeoff and landing performance data:-

The Takeoff and Landing Performance Data feature on the FMS-3000 automatically computes V-speeds and required field lengths based on inputs entered on the TAKEOFF REF or APPROACH REF pages. Inputs that are automatically entered (e.g., those available from the FMS flight plan or other sources) appear in a small white font, whereas manually entered data is in large white font. For input fields that may be toggled, a large green font is used to identify the selected value.

Manual entry of RWY WIND (preceded by H for headwind and T for tailwind) overrides computations based on a WIND (direction/speed) entry. Manual entry of RWY LENGTH overrides values obtained from the database for a specific RWY ID. The chosen value for takeoff/landing weight is that which exists at the time the TAKEOFF REF or APPROACH REF page is entered. Manual entry of TOW or LW may be used if a significant weight difference exists, at the time of takeoff or landing, from that which performance computations were based on.

Computed V-speeds are displayed on the CDU in white font until the SEND command is executed to post the speeds to the PFDs. When the send command is complete, the V-speeds on the CDU will change to cyan and V-speeds will be displayed in magenta on the PFDs. If any posted speed is manually overridden, it will change to cyan. Any changes made to input parameters after the V-speeds have been posted will cause an amber VSPEEDS DESELECTED message to appear on the CDU and remove the V-speeds from both the CDU and PFDs.

ii. Data for Water Covered Runways

As per the content of AFM:-

A runway is considered contaminated when more than 25 percent of the runway surface area (whether in isolated areas or not) within the required length and width being used, is covered by surface water more than 3 millimetres (0.125 inch) deep.

For landing on contaminated covered runways, crew needs to incorporate correction factors based on the table values while calculating landing performance. The performance information assumes runway contaminant to be of uniform depth and density over the entire runway surface. The impingement drag is based on testing performed on a Cessna Citation CJ2+.

WARNING contained in AFM states that *"THESE DISTANCES AND CORRECTION FACTORS FOR CONTAMINATED RUNWAY CONDITIONS ARE APPROXIMATE AND ARE TO BE CONSIDERED MINIMUMS, AS ACTUAL RUNWAY CONDITIONS MAY REQUIRE DISTANCES GREATER THAN THOSE DETERMINED. WHERE POSSIBLE, EVERY EFFORT SHOULD BE MADE TO ENSURE THAT THE RUNWAY SURFACE IS CLEARED OF ANY SIGNIFICANT CONTAMINATION. GROUND HANDLING CHARACTERISTICS, PARTICULARLY FOLLOWING ENGINE FAILURE OR IN CROSSWINDS, MAY BE DEGRADED."*

The published maximum limiting tailwind component for this airplane is 10 knots. However, landings on precipitation covered runways with any tailwind component are not recommended.

1.18.7 Aircraft Loading

As per the Load and Trim sheet prepared by the PIC, aircraft had 10 Kgs and 60 Kgs of load in nose baggage and tail baggage compartment respectively. After deplaning all passengers, aerodrome operator had collected passenger's baggage and their belongings from the aircraft for handing over to passengers, as the aircraft got stuck on the unpaved surface of the runway strip. Before handing over to the passengers, weighing of all items was carried out and a total of 176.16 Kgs of goods was calculated.

In company's approved weight schedule, it is clearly laid down that the maximum payload with fuel tanks full is 100.61 Kgs. However, fuel uplifted was 1400

Kgs which was 414 Kgs less than the full fuel capacity of the aircraft. In addition to this, the total actual weight of all passengers including two crew was found 455 Kgs instead of 620 Kgs as mentioned in the Load & Trim Sheet.

It is evident that the aircraft actual takeoff weight was within the limit, however, the Load & Trim Sheet was not filled properly.

1.18.8 Aircraft Emergency Plan

Aircraft Emergency Plan made by the aerodrome operator has laid down the visibility criteria to operate at Nanded airport. As per the Emergency Order mentioned in the AEP, visibility /weather standby will be issued when "Visibility 3000m or less and or cloud base 1500ft with 4 octas or more / Heavy rain, Gusty wind, Dust. Storm, etc".

ACTION: Air Traffic Control Tower shall declare visibility/weather standby and inform Fire Station along with Runway-in-use.

1.18.9 Incident and Accident Reporting

Aerodrome Manual states that "Reporting of an accident is required as per Rule 68 of the Aircraft Rules 1937".

Notification is done to the Office of DGCA and other authorities as said in

- CAR Section 5 Series C Part 1
- Air Safety circular 03/2015
- Aviation Safety circular 1/2001 (AAI)
- As per Rule 86 sub-rule (5) of the Aircraft Rules 1937.

1.18.10 Disabled Aircraft Removal

The operator's aerodrome manual has disabled aircraft removal procedure defined in Chapter 4 which has following guidelines and deemed actions suggested for removal of aircraft from the accident/incident site.

The Airport Director has the overall responsibility for the implementation of Disabled Aircraft Removal Plan at the Aerodrome as per the Aerodrome Manual Chapter 4.

The Manager (Airside Operations) is responsible for controlling and coordinating the response from respective stakeholders for efficient recovery of a disabled aircraft. This may require liaison with the aircraft operator and the Air Safety Investigation Team, DGCA and/or Local Police (if involved) to obtain a clearance to remove the aircraft. Each respective manager plays a significant role in ensuring efficient implementation of the plan.

Aircraft Owner/Operator

As per the procedure mentioned in Para 4.15.2, Chapter 4 prior approval for aircraft removal is required from Air Safety Investigation Team, DGCA and/or the Police for accident of a more serious nature that require an on-scene investigation.

Role of DGCA and Police

As per the manual Para 4.15.2, Chapter 4, DGCA shall take all reasonable measures to maintain safe custody of the aircraft and its contents for such a period as may be necessary for the purpose of further investigation.

The Police (if involved through activation of the AEP) in conjunction with the Air Safety Investigator shall authorize the removal of a disabled aircraft when the on-scene investigation has been completed.

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 incident. The scrutiny of the Airframe Log book revealed that as on 11th Sep 2019, the aircraft had completed 3593:01 Hrs (TSN)

and 3610 landings (CSN). Both Engines had logged 3431:34 hrs/ 3424 cycles since new. The last major 72 months inspection was carried out at 3536:55 Hrs/ 3540 cycles on 01.07.2019. Subsequently, all lower inspections (Pre-flight checks, Service Checks, Weekly Checks) were carried out as and when due.

Scrutiny of the aircraft records revealed that all modifications on the aircraft were found to be complied with at the time of incident. Scrutiny of the snag register revealed that there was no pending snag reported on the aircraft prior to the incident flight and was neither operating under any MEL.

Aircraft was under load for the sector Mumbai- Nanded and the aircraft weight & balance was well within the operating limits. However, the information provided by the crew in Load & Trim sheet was not based on the actual load uplifted by the aircraft.

Boroscopic inspection carried out on both engines after the incident revealed that engine internal condition was satisfactory and no performance degradation could have resulted during the incident flight.

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

2.2 WEATHER

Initial weather information passed by ATC Nanded at 1757 UTC was winds 280º/05 knots which were favourable to approach and land on runway 28.

Before landing, winds were updated to the crew twice. However, ATC Nanded did not provide any information relative to heavy precipitation or runway contamination, while the aircraft was in approach for runway 10. The last meteorological information provided by the controller to crew at 182533 UTC was "wind 250°/10 knots" while granting landing clearance.

Weather was not conducive at Nanded airport for aircraft's landing on runway 10 at the time of incident.

2.3 SELECTION OF RUNWAY

Aircraft took off from Mumbai at 1734 UTC and came in contact with ATC Nanded at around 1757 UTC. After weather update from ATC Nanded and while the aircraft was at approximately 148 Nm, PIC instructed FO to request ATC to allocate runway 10 which was straight in approach. Accordingly, after passing aircraft position, FO requested ATC Nanded for runway 10 if possible. ATC controller intimated the crew that approach light system for runway 10 is unserviceable. Subsequently, the FO responded "Copied" but it was neither confirmed from both stations whether runway 10 had been allocated or not. PIC was in the impression that ATC Nanded had granted the permission for landing on runway 10 and accordingly continued the flight.

While the aircraft was at 25 Nm from Nanded, crew again contacted ATC. Aircraft was cleared for VOR-DME approach runway 28. FO communicated to ATC that they had already requested for runway 10. Crew was once again notified that approach lighting is unserviceable and requested to confirm if they still wish to come for runway 10. Crew responded "Affirm". Thereafter, weather was updated to crew. However, from CVR recordings, it is evident that till that time, crew had not taken into the account of tailwind component due to improper data feed into the FMS and more emphasis was given on avoiding cloud patch present above the runway. Moreover, the flight was an organ flight, and as runway 10 was straight in approach, crew possibly desired to reduce the ETA. In spite of tailwind and unavailability of approach light system, crew preferred to land on runway 10.

2.4 CVR AND ATC ANALYSIS

CVR and ATC tape transcript were analysed and it has been observed that initially Weather was passed when aircraft came in contact with ATC Nanded at 1757 UTC and winds were favourable for landing on runway 28. However, at 1758 UTC, crew requested for runway 10 if possible. Subsequently, ATC transmitted that approach lighting system for runway 10 is unserviceable. Although no confirmation

was made by both stations, crew presumed that ATC controller had given the permission for runway 10 and crew continued for destination.

During enroute, aircraft also encountered weather and as a precaution PIC diverted the aircraft towards left to avoid weather. At 1813 UTC, PIC asked the FO about the winds. FO informed headwinds 3 knots (which was based on the previous data feed into the system in respect of runway 28). At 1819 UTC, While the aircraft was at 25 Nm, crew reported ATC Nanded. ATC cleared the aircraft for VOR-DME approach runway 28 and requested to report leaving NDD. Immediately, crew responded that they had requested for runway 10 when initially aircraft came in contact with ATC Nanded. Subsequently, ATC controller asked the crew to report once established on final approach track for runway 10.

During descent, PIC discussed with the FO that they would initiate missed approach and take heading 090 in case aircraft encounters heavy turbulence. While the distance to go was around 16 Nm, FO confirmed terrain in sight. Thereafter, Crew discussed that in case of wet runway, they would apply emergency brakes also.

At 1823 UTC, PIC asked the FO to give the wind values. FO provided wind 030º/07 knots. PIC was not convinced with the values and asked the FO to confirm with the ATC. ATC updated wind 250/09 knots and during that time only crew realised that winds data fed into the FSM was based on the runway 28. FO fed the updated values and crew become aware ~~of~~ that aircraft would face tailwind condition in case aircraft lands on runway 10. However, crew continued to approach runway 10 as 8 knots was within tailwind limitations.

At 1825 UTC, crew reported final approach fix for runway 10. Subsequently, ATC cleared the aircraft to land on runway 10 and finally two minutes before landing wind updated was 250º/10 knots. FO requested ATC to increase the intensity of runway lights. Intensity was increased from level 4 to level 5.

FO was continuously monitoring the speed of the aircraft. Aircraft landed at Nanded airport at 1827 UTC. After touchdown, FO suggested the PIC to uphold the

aircraft slightly towards right as aircraft was continuously veering towards left. Aircraft exited the paved surface and crew communicated to ATC that aircraft encountered runway skid.

2.5 NON ADHERENCE TO SOP

2.5.1 Non adherence to FCOM

As per the company FCOM, the maximum tailwind component limitation for the aircraft is 10 knots. However, landings on precipitation-covered runways with any tailwind component are not recommended. While the aircraft was in final approach, the last meteorological information provided by the controller was "wind 250°/10 kt".

Although the wind information was passed, crew were never cautioned regarding precipitation and runway contamination by the ATC.

PIC stated that while the aircraft was at MDA, they were in VM and FO confirmed terrain in sight. After touchdown only they lost all visual references due to heavy downpour on the runway. And during probe, it has been established from CVR transcript that crew were not apprised of runway condition during the flight by ATC Nanded. However, the touchdown occurred with a tail wind of around 10 kt which exceeded tailwind component limitation as prescribed in FCOM.

2.5.2 Non Adherence to Aerodrome Emergency Plan

As per Operator's Aerodrome Emergency Plan, Air Traffic Control Tower shall declare visibility/weather standby when visibility drops to 3000 m or less and or cloud base 1500 feet with 4 octas or more / Heavy rain, Gusty wind, Dust. Storm, etc. and shall inform Fire Station along with Runway-in-use.

However, ATC did not adhere to the aforesaid guidelines laid down in Operator's Aerodrome Emergency Plan after visibility dropped below 3000 m during heavy precipitation on runway.

2.6 WINDSHIELD AND RAIN REPELLENT SYSTEM

During probe, PIC admitted that no repellent was applied on the windshield before operating the involved flight. Further, PIC stated that the Rain removal system of the Cessna Citation CJ2+ was not found effective during some preceding flights and did not rely on the system based on past experience.

2.7 REGULATION ON NOTIFICATION OF OCCURRENCES

As per the Rule 4, Para 1 of Aircraft (Investigation of Accident and Incident) Rules, 2017 prevalent on day of incident *" Where an accident or an incident occurs to an aircraft covered under sub-rule (2) of rule 1, then the pilot-in-command of the aircraft or, if he be killed or incapacitated, the owner, the operator, the hirer or other person on whose behalf he was in command of the aircraft, or any relevant person, as the case may be, shall, as soon as is reasonably practicable but in any case not later than 24 hours after he becomes aware of the accident or the incident —*
(a) send notice thereof to the Aircraft Accident Investigation Bureau and Director-General of Civil Aviation by the quickest means of communication available;"

Further as per Rule 4, Para 4 of Aircraft (Investigation of Accident and Incident) Rules, 2017 *"The notification as required in sub-rule (2) shall also be submitted to the Bureau by the concerned –(a) aerodrome operator;(b) Air Traffic services in-charge concerned; and (c) DG,CA, wherever applicable."*

DGCA approved aerodrome manual of the operator did not mentioned that the incident is to be notified to AAIB and the rules quoted needs to be updated as per Aircraft (Investigation of Accidents and Incidents) Rules 2017.

2.8 REGULATION ON DISABLED AIRCRAFT REMOVAL

As per the Rule 7, Sub Rule (1) of Aircraft (Investigation of Accident and Incident) Rules, 2017 " *In the case of an accident or a serious incident, which is required to be notified under Rule 4,the Investigator-in-Charge shall have unhampered access to the wreckage and all relevant material and information, including flight recorders and Air Traffic Services records, and shall have unrestricted control over it*

to ensure that a detailed examination can be made without delay by authorised personnel participating in the investigation" .

Further, as per Rule 7, Sub Rule (2) "*The aircraft and contents thereof shall not, except by a person under the authority of the DG, AAIB, be removed or otherwise interfered with:*

Provided that-

(a) the aircraft or any parts or contents thereof may be removed or interfered with so far as may be necessary by persons authorized to conduct search and rescue operations for the purpose of extricating persons or animals dead or alive, or preventing the destruction of the aircraft and its contents by fire or other cause, or preventing any damage or obstruction to the public or to air navigation or to other transport;

(b) if the aircraft is wrecked on water, the aircraft or any parts or contents thereof may be removed o such extent as may be necessary for bringing it or them to a place of safety by persons authorised to conduct search and rescue operations;

(e) mails photography, weighing etc. may be removed under the supervision of a Police Officer, a Magistrate, an Officer of the Department of Posts and Telegraphs or an Officer of the Aircraft Accident Investigation Bureau or a person authorised by DG, AAIB."

Sub Rule (8) states that "The Aircraft Accident Investigation Bureau *shall be the sole agency regarding the custody of the evidence collected during the investigation including the wreckage and recorders, and in case of requirement of access to such evidence by any other agency, DG, AAIB after being satisfied for requirement of such access may facilitate such access while retaining the custody thereof".*

The above requirements are not complied in the DGCA approved Aerodrome Manual.

2.9 CIRCUMSTANCES LEADING TO INCIDENT

The flight was a medical flight and was delayed at Mumbai due to delay in arrival of Medical Team. Aircraft took-off from Mumbai at 1734 UTC. The enroute flight was uneventful and no abnormality was observed by the crew. However, crew encountered bad weather enroute and as a precaution, performed a left deviation to avoid the patch.

During flight, initially wind values in respect of runway 28 was inadvertently bugged into the system.PIC was in the impression that the wind values in FMS were depicting the condition for runway 10. PIC preferred to land on runway 10 inspite of runway 28 suggested by ATC as runway 10 was straight in approach and as per FMS, wind was within the limits. Since the scheduled flight was an organ flight, Crew wanted to save time with selection of runway 10.

While the aircraft was in descent phase, PIC realised that the wind component provided by the FO for runway 10 appeared to be incorrect and instructed FO to again confirm winds. ATC transmitted winds 250º/09 knots. After bugging the correct values, PIC observed that aircraft would be landing in tailwind conditions if they select to land on runway 10. PIC anticipated wet runway and checked the runway length which was found sufficient. However, ATC Nanded did not give any information about rain during the final approach. While the aircraft was at 16 Nm, FO confirmed terrain in sight and at the same time, FO requested ATC to increase the intensity of light.

As per PIC's statement, they were maintaining correct approach profile while flying under VMC & non-precision approach but after touchdown they lost all visual references. Further, due to illusion effect created by runway edge lights, crew could not judge the runway centreline. In addition to this, runway contamination scattered the runway edge light on runway which resulted in further scattering of light on windshield. Crew was not able to take timely corrective action as the aircraft landed at a higher landing speed in poor visibility condition.

After the aircraft left the paved surface, crew tried to bring it back on runway, however, LH main landing gear tyre had deflated after it ran over one of the runway edge light, due to which pilot could not control the aircraft further.

3. CONCLUSION

3.1 FINDINGS

1. The Certificate of Airworthiness, Certificate of Registration and Certificate of Flight Release of the aircraft were current/valid on the date of incident.

2. Both pilots were qualified on type to operate the flight and had undergone prefight medical examination at Mumbai before operating the flight. The result of medical examination was satisfactory.
3. There was no snag reported on the aircraft prior to the incident flight.
4. Initial MET information passed to the aircraft was Visibility - 3000 meters, Wind - 280º/05 knots, Weather - rain, Cloud - Few at 1800', Scatter at 2500' and Broken at 8000'.
5. While the aircraft was at 148 Nm, crew apprised ATC of their preference for Runway 10 to which ATC Nanded responded by informing about unserviceability of Approach lighting system.
6. FO confirmed terrain in sight when aircraft was at 16 Nm from aerodrome.
7. FO requested ATC to increase the intensity of runway edge lights.
8. Runway centre lights were unserviceable and some of the edge lights were covered under the grass.
9. PIC informed ATC about his preference for runway 10. The visual approach for runway 10 under VFR condition was carried out.
10. ATC Nanded cleared the aircraft for landing on runway 10 and simultaneously passed the winds 250°/ 10 knots.
11. Aircraft landing was performed at a tail wind of around 10 kts. As per the company "Operation Manual", the tailwind restriction for landing is 10 knots.
12. After touchdown, crew observed heavy rain and runway contaminated.
13. After touchdown, crew did not observe failure of the braking system and as per crew, emergency brakes worked normally.
14. Aircraft exited the runway on left after travelling approximately 400 meters.
15. LH tyre of the aircraft burst and nose wheel sheared off during the incident and crew lost the directional control.
16. Aircraft came to a halt at approximately 1300 m from runway 10 threshold and offset distance from the runway edge was 26 m.
17. The aircraft sustained substantial damage which was beyond economical repair.
18. Normal deplaning of the passengers was carried out by the FO from the main door.

19. There was no injury to any of the occupants onboard the aircraft.
20. There was no post incident fire.

3.2 PROBABLE CAUSE

Crew carried out landing on contaminated runway without anticipating maximum limiting tailwind component and after touchdown could not ascertain the runway centre line due to illusion effect which resulted into aircraft lateral runway excursion.

4. SAFETY RECOMMENDATIONS

4.1 DGCA shall audit the aerodrome facility of Nanded airport to ensure that the operator has complied with the guidelines laid down in Aerodrome Manual.

4.2 DGCA shall issue instructions to all aerodrome operators to update their Aerodrome Manual as per the Aircraft (Investigation of Accidents and Incidents) Rules 2017.

4.3 DGCA shall issue instructions to AAI to direct all ATC units to meticulously follow the weather minima specifically during monsoon season and apprised all flights about runway contamination well in advance.

4.4 DGCA shall issue instructions to all NSOP to adhere to the procedures laid down in Operations Manual regarding rain repellent system while performing operations during monsoon weather.

4.5 Requirement of AFM and OM with respect to tailwind limitation should be reiterated to the crew.

Amit Kumar
Investigator

Dinesh Kumar
Investigator-In-Charge

Dated: 30.04.2020
Place: New Delhi