FINAL REPORT OF SERIOUS INCIDENT INVOLVING M/s A R AIRWAYS CESSNA CITATION 550 S II AIRCRAFT VT-KMB AT BANSWARA ON 27/10/2016

Jasbir Singh Larhga
Chairman, Committee of Inquiry

K. Ramachandran
Member, Committee of Inquiry

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 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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FINAL REPORT ON SERIOUS INCIDENT TO M/s A R AIRWAYS CESSNA CITATION 550 S II AIRCRAFT VT-KMB AT BANSWARA ON 27/10/2016

1.	Aircraft Type	: Cessna Citation 550 SII
	Nationality	: INDIAN
	Registration	: VT - KMB
2.	Owner	: M/s A R Airways (P) Ltd.
3.	Operator	: M/s A R Airways (P) 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	: Banswara Airport, Rajasthan
7.	Date & Time of Incident	: 27th Oct 2016, 0745 UTC
8.	Last point of Departure	: Mumbai
9.	Point of intended landing	: Banswara
10.	Type of operation	: Non-Scheduled Operation
11.	Crew on Board	: 02
	Extent of injuries	: Nil
12.	Passengers on Board	: 07
	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 27th October 2016, M/s A R Airways Pvt. Ltd. Cessna Citation 550 SII aircraft VT-KMB was involved in a serious incident at Banwara, Rajasthan while operating flight from Mumbai to Banswara. The aircraft was under the command of a pilot holding valid ATPL on type with first officer holding valid CPL on type. There were 07 passengers on board the aircraft.

The aircraft took-off from Mumbai for Banswara at 0635 UTC with 07 passengers on board. The enroute flight was uneventful. The aircraft approached runway 28 for landing. The aircraft landed at Banswara at 0745 UTC and immediately after touchdown the LH main wheel tyre burst. The aircraft then started veering to the left and finally exited the runway on left after rolling for about 520 meters. All passengers and crew were unhurt and deplaned normally with some assistance from emergency service personnel. There was no fire.

The occurrence was classified as Serious Incident as per the Aircraft (Investigation of Accidents and Incidents) Rules, 2012. Committee of Inquiry was appointed by Ministry of Civil Aviation vide its notification Ref AV.15013/9/2016-DG appointing Mr. Jasbir Singh Larhga, Assistant Director AAIB as Chairman and Mr. K Ramachandran, Air Safety Officer, AAIB as Member.

Initial notification of the occurrence was sent to ICAO and NTSB, USA as per requirement of ICAO Annex 13. Ms. Zoë Keliher was appointed as accredited representative by NTSB, USA under ICAO Annex 13.

1. FACTUAL INFORMATION

1.1 History of the flight

The aircraft VT-KMB use to be stationed generally at Surat and operated to other places based on the requirements. Prior to the day of incident, the aircraft had operated a Mumbai – Pune - Mumbai flight on 25.10.2016. It was planned to pick passengers from Mumbai and land at Banswara on 27.10.2016. However, aircraft did not get parking space at Mumbai airport after arriving form Pune and hence had to be flown to Ahmedabad airport and remained parked at Ahmedabad on 26.10.2016.

On 27.10.2016, VT-KMB was planned to operate in Ahmedabad - Mumbai Banswara – Mumbai – Banswara sector. Accordingly, the crew reported for duty at Ahmedabad and got their BA test done at Ahmedabad, as per requirement of CAR Section 5, Series F, Part III. The test was satisfactory. After the briefing, crew headed to the aircraft to operate the flight for Mumbai to pick passengers who were to be dropped at Banswara.

Aircraft took off from Ahmedabad at 0010UTC and landed at Mumbai at 0120 UTC. The aircraft then took - off for Banswara at 0240 UTC with 07 passengers on board. The aircraft had an uneventful flight and landed at Banswara at 0340UTC.

After offloading the passengers, the aircraft again took off from Banswara at 0415 UTC to Mumbai to pick another set of passengers. The flight from Banswara to Mumbai was also uneventful and the aircraft landed at Mumbai at 0515 UTC. The aircraft was again scheduled to fly to Banswara with another set of 07 passengers.

As per the Load and Trim Sheet, the Take-Off weight of the aircraft for this leg of journey was 6847 Kgs and landing weight was calculated to be 6303 Kgs. After boarding 07 passengers, aircraft again took - off for Banswara at 0635 UTC.

The aircraft landed at Banswara on Rwy 28 at 0745 UTC and immediately after touchdown, the LH main wheel tyre burst and the wheel hub started scrapping

the runway surface. The crew applied the thrust reversers and speed brakes, however, aircraft continue to roll for about 100 meters, and started deviating to the left.

Touchdown point on runway

Pilots applied right rudder and attempted to bring the aircraft back to the centreline. However, the aircraft kept deviating to the left and travelled around 200 m before turning slightly towards right. The aircraft travelled to the right i.e. towards runway centreline for 150m before beginning to turn towards left again. Aircraft then continued to deviate toward left till it exited the runway at a distance of 600 m from the threshold.

Runway surface scraped by LH wheel after tyre burst

The aircraft travelled around 50m on unpaved surface before coming to a halt at a distance of 20m from the runway edge. All passengers and crew were unhurt and were deplaned normally with assistance from emergency service personnel.

1.2 Injuries to persons

INJURIES	CREW	PASSENGERS	OTHERS
FATAL	Nil	Nil	Nil
SERIOUS	Nil	Nil	Nil
~~MINOR~~/NONE	02	07	Nil

1.3 Damage to Aircraft :

The LH tyre of had burst immediately after landing. The LH wheel hub was damaged due to scraping the runway surface.

LH Wheel of the aircraft after incident

Damage observed on inner edge of the LH flap

LH flap inner trailing edge was found chipped off. The operator carried out hard landing inspection after the incident and no abnormality was observed.

1.4 Other damage: NIL

1.5 Personnel information

1.5.1 Pilot – in – Command

AGE	:	56 years
License	:	ATPL Holder
Category	:	Aeroplane
Validity	:	16.02.2017
Endorsements as PIC	:	P68C, CE-550 C II/ S II/ Bravo
Date of Med. Exam.	:	13.07.2016
FRTO License Validity	:	17.11.2019
Total flying experience	:	5086 Hrs
Experience on type	:	410:00 Hrs
Experience as PIC on type	:	189:00 Hrs
Total flying experience during last 180 days	:	160:15 Hrs
Total flying experience during last 90 days	:	115:20 Hrs

Total flying experience during last 30 days	:	44:00 Hrs
Total flying experience during last 07 days	:	25:00 Hrs
Total flying experience during last 24 Hrs	:	05:30 Hrs

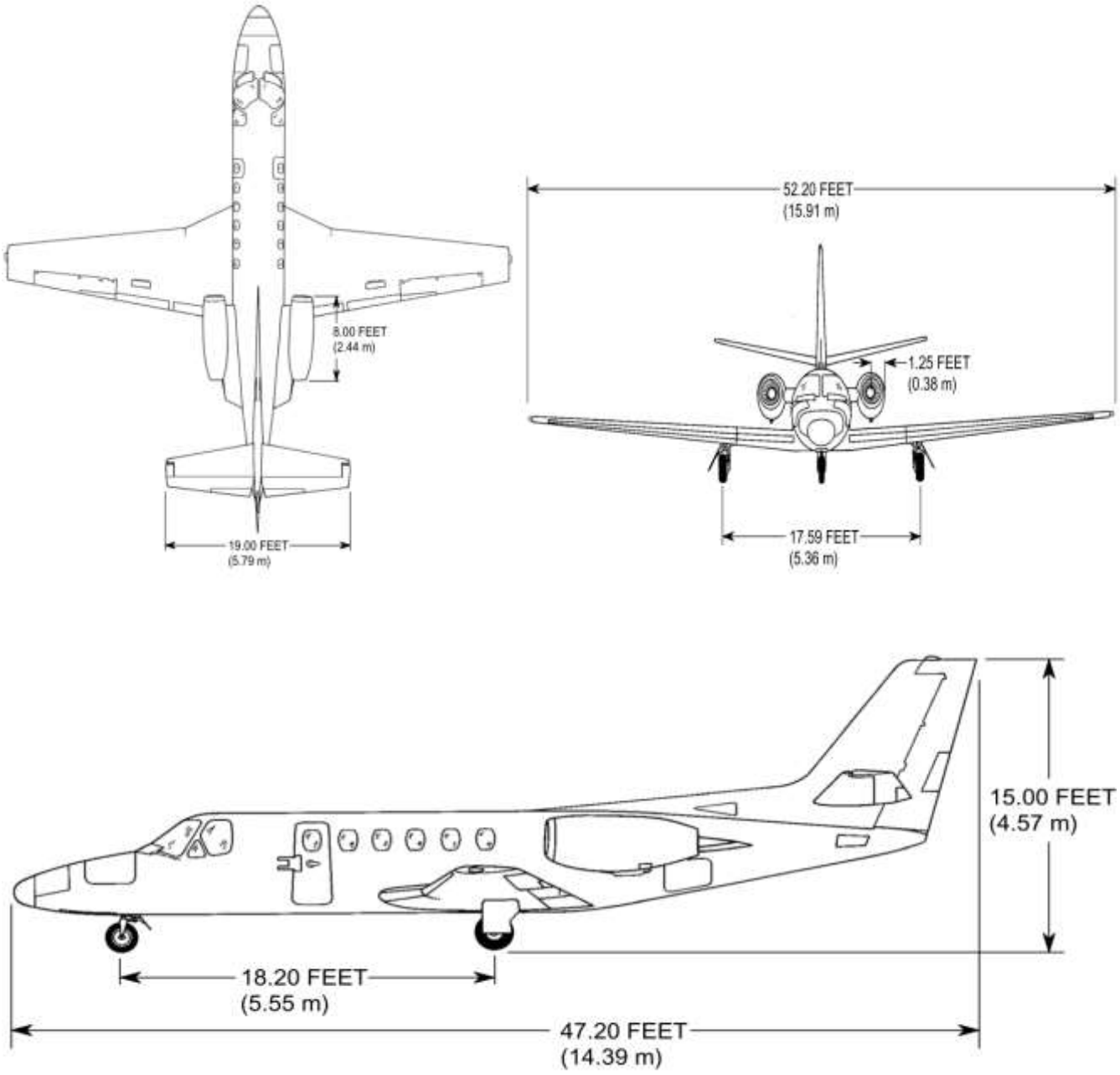
1.5.2 Co-Pilot

AGE	:	36 years
License	:	CPL Holder
Category	:	Aeroplane
Validity	:	24.08.2019
Endorsements as PIC	:	Cessna 172R, Piper Seneca PA-34,
Endorsements as F/O	:	B737-800, A-320, CE-550 CII/SII/ Bravo
Date of Med. Exam	:	10.12.2015
FRTOL Validity	:	24.08.2019
Total flying experience	:	736:05 Hrs
Experience on type	:	304:50 Hrs
Total flying experience during last 180 days	:	160:15 Hrs
Total flying experience during last 90 days	:	111:40 Hrs
Total flying experience during last 30 days	:	44:00 Hrs
Total flying experience during last 07 days	:	25:00 Hrs
Total flying experience during last 24 Hrs	:	05:30 Hrs

Both pilots were not involved in any serious incident/ accident in the past as per the details available from the operator. Both pilots were current in all training and had adequate rest as per the Flight Duty Time Limitations (FDTL) requirement prior to operating the incident flight.

1.6 Aircraft Information:

Cessna Citation 550 SII is a fixed wing twin engine aircraft manufactured by Cessna Aircraft Company, Kansas, USA. The aircraft is certified in transport category, for day & night operation. The maximum operating altitude of this aircraft is 43,000 feet and maximum take-off weight is 6849 Kgs. Aircraft length is 47.20 feet, width is 52.20 feet, height of this aircraft is 15 feet. The standard seating configuration is 02 Pilots and 08 passengers.



Three view Diagram (Showing Dimensions) of Cessna Citation 550 SII aircraft

Construction

Fuselage

The Cessna Model S550 fuselage is an all-metal semi-monoque structure. The fuselage comprises a nose section, center section and tail section.

- The nose section contains the avionics equipment compartment, nose baggage compartment and the nose gear wheel well.
- The center section contains the flight crew compartment, forward baggage/toilet compartment and cabin (passenger) compartment.
- The tail section contains the heating, air conditioning and fresh air systems, electrical junction boxes and tail cone luggage provision.

The fuselage main frame is constructed of transverse frames, longitudinal stiffeners and lateral floor beams. The fuselage auxiliary structure includes the nose baggage compartment shelves and divider, forward and aft pressure bulkhead, flight crew and cabin compartment floor panels and the pedestal. The fuselage exterior covering is made up of aluminum alloy skin panels of varying lengths and widths. The panels are attached to frames, stringers and doublers with permanent fasteners. Fittings are provided in the fuselage for the attachment of the doors, seats, brackets and supports. Most fittings are secured to the fuselage structure with permanent fasteners. Fairings on the fuselage provide aerodynamic smoothness around the attachments of the nose cone, wings, dorsal fin and stinger.

Wings

The wing structure main frame consists of two top and two bottom span wise stringers, two span wise spars, chord wise ribs and leading edge. The wing spars (main and rear) consist of upper and lower extruded spar caps, joined by sheet spar webs and angles. Chord wise support of the wing is provided by ribs constructed of extruded tees, formed caps and sheet webs. Except for the area above, the main landing gear well, the integral fuel tank includes all the wing area forward of the rear spar. Liquid-tight ribs at the inboard and outboard ends of the wing complete the boundaries of the

fuel tanks. The wing tip is isolated from the outboard fuel by sealed ribs and a vented barrier. Except for the inboard end, the leading edge is a fixed structure. The leading edge fixed structure consists of stringers and ribs. The leading edge contains the leading edge anti-ice system; the panels incorporate stall strips and are attached to the wing with screws. Metal-to-metal joints in the fuel tank structure are sealed to form a liquid-tight structure. The interior surface of the tank is chemically treated and coated with epoxy primer for corrosion resistance.

Powerplant

The aircraft is installed with Pratt & Whitney JT15D-4B engine which is a lightweight twin spool, front turbofan, jet propulsion engine having a full length annular bypass duct. The low pressure compressor rotor assembly consists of a front fan and a primary gas path booster stage rotor. A concentric shaft system supports the high and low pressure rotors. The inner shaft supports the low pressure compressor and is driven by a two-stage turbine. The outer shaft supports the high pressure centrifugal compressor and is driven by a single-stage turbine.

During engine operation, air enters the engine through the inlet assembly through one set of vanes following the fan stage and a second row of vanes following the booster stage. The second row of stator vanes directs primary air through an inlet guide stator vane assembly to the centrifugal impeller. The high pressure air from the impeller passes through a diffuser assembly which returns flow direction to axial; the air then passes around the combustion liner. The air to the bypass duct passes through two rows of staggered vanes and flows rearward to discharge through the annular nozzle. The inlet flange assembly bolts to the forward side of the low compressor case. The forward end of the inlet flange assembly mates to the nacelle inlet assembly.

Bypass.

- A two-section bypass duct is installed on the engine. The forward bypass duct section is supplied with the engine. The aft bypass duct section assembles to the forward bypass duct. The bypass duct provides airflow passage for the fan.

- Airplanes with the optional thrust reversers installed, have the forward bypass section supplied with the engine. The aft bypass section attaches to the forward bypass. A shim (internal ring) is installed in the thrust reverser bypass to increase performance by increasing thrust and cruise speeds.

Cessna Citation 550 SII aircraft VT-KMB (MSN S550-0135) was manufactured in the year 1987. The aircraft is registered with DGCA under the ownership of M/s A R Airways Pvt Ltd. The aircraft is registered under Category 'A' and the Certificate of registration No. 2550/3 was issued on 13.06.2007.

The Certificate of Airworthiness (COA) Number 2045 under "Normal category" subdivision Passenger was issued by the DGCA on 22.09.1993. The specified minimum operating crew is “Two” and the maximum all up weight is 6849 Kgs. The COA remains valid subject to validity of Airworthiness Review Certificate(ARC). Last ARC was issued by DGCA on 11.02.2016 and was valid till 12.02.2017.

The Aircraft was holding a valid Aero Mobile License No A-060/004-RLO (NR) at the time of incident. The Aeromobile license was issued on 29.12.2014 and was valid upto 31.12.2016.

This Aircraft was operated under Non-Scheduled Air Operator Permit No 01/2005 initially issued on 12.05.2005 and renewed on 08.05.2015. The permit was valid up to 11.05.2017.

The aircraft was last weighed on 22.11.2013 at New Delhi and the weight schedule was prepared and duly approved by the office of Director of Airworthiness, DGCA, New Delhi. As per the approved weight schedule, the Empty weight of the aircraft is 4126.21 Kg and the Maximum take-off weight of the aircraft is 6849.00 Kg. Maximum Usable fuel Quantity is 2620 Kg. Maximum payload with fuel tanks full is -67.21 Kg. Empty weight CG is 289.16 inches aft of datum. As there has not been any major modification affecting weight & balance since last weighing, hence the next weighing is due on 21.11.2018.

Aircraft had logged 4326.20 Hrs till the date of incident. Last major inspection on the aircraft was Phase 1 and Phase 2 inspection that was carried out at 4230 Hrs on 16th April 2016.

Aircraft was equipped with JT15D-4B engines. The LH Engine Sr. No PCE102244 had logged 851:05 Hrs as on the date of incident. Last major inspection on this engine was Phase 1 and 2 inspection which was also carried out on 16th April 2016. RH Engine Sr No PCE102280 had logged 866 Hrs till the date of incident. Last major inspection on this engine was Phase 1 and 2 inspection carried out on 16th April 2016.

All concerned Airworthiness Directives, mandatory Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engine had been complied with as on date of event. The snag register of the aircraft was scrutinized and it was observed that no snag was reported on aircraft since 21.05.2016. There was no pending snag on the aircraft on the day of incident

1.7 Meteorological information:

As per the crew briefing documents, crew had obtained weather from Udaipur which was closest to destination airport.

As per the weather reported at Udaipur at 0400 UTC, the winds were 340° and 03 Kts, Visibility was 6000 meters with no significant clouds and no significant change was expected. As per the pilot, the weather during the time of landing at Banswara was fine with visibility more than 8 Kms.

1.8 Aids to navigation:

No Navigation aids were available at Banswara Airport.

1.9 Communications:

No ATC was available at Banswara airfield. Hence, the aircraft was not in contact with any ATC during landing at Banswara.

1.10 Aerodrome information:

Banswara Airfield is under controlling authority of Govt. of Rajasthan. The nearest airport from Banswara is Ratlam which is 76.39 Km away. Udaipur Airport is located at 121.48 Km from Banswara.

Satellite map view of Banswara airstrip

As per DGCA 18/1986, the Banswara airfield is a State Govt. Aerodrome not necessarily maintained in a serviceable condition. The runway information as per DGCA AIC 18/1986 is as below:

Longitude	Latitude	Elevation	Runway No / Direction	Runway Dimension (Meters)	Surface	Controlling Authority
23º 35’30”	74º 20'	180M	10/28	1140 X 40	Muram	Govt. of Rajasthan

As per the information available from the Office of Executive Engineer, Public Works Department, Banswara, which is responsible for maintenance of airfield, the airstrip is owned by the Directorate of Civil Aviation, Govt. of Rajasthan and on the date of incident, the dimension of runway was 1723 meters X 30 meters. The runway surface was Semi Dense Bituminous Concrete and no navigational aids were available at the airfield. A windsock is available at the airfield to provide information about winds.

The permission for landing and take-off from Banswara airfield is granted by the Directorate of Civil Aviation, Govt. of Rajasthan with intimation to the local district authorities for provision of security and emergency services. The permission was granted for operating VT-KMB on 24.10.2016.

1.11 Flight recorders:

The aircraft was equipped with CVR and FDR on the date of incident. The details of CVR and DFDR units are as follows.

DFDR Details:	**CVR Details:**
Make: L3 Aviation Recorders Model: FA2100 Part No. : 2100-4045-00 S/N: 000849127	Make: L3 Communications Model: A200S Part No. : S200-0012-00 S/N: 000107175

The DFDR and CVR units of the aircraft were removed from the aircraft at Banswara and brought to New Delhi.

1.11.1 Cockpit Voice Recorder

The CVR was downloaded at DGCA's CVR Lab in the presence of CoI. During replay of CVR recording, it was observed that the recording of the incident flight was not available in the CVR. The CVR recording contained voices from some maintenance activity that was carried out prior to the flight. The aircraft maintenance and flying records were scrutinized and statements of pilots and maintenance personnel were taken to ascertain the date of recording available in CVR.

On observing that incident flight recording was not available in CVR, the aircraft was thoroughly checked for serviceability of CVR on ground at the incident site before ferry flight to Delhi for repairs. The CVR systems were found serviceable.

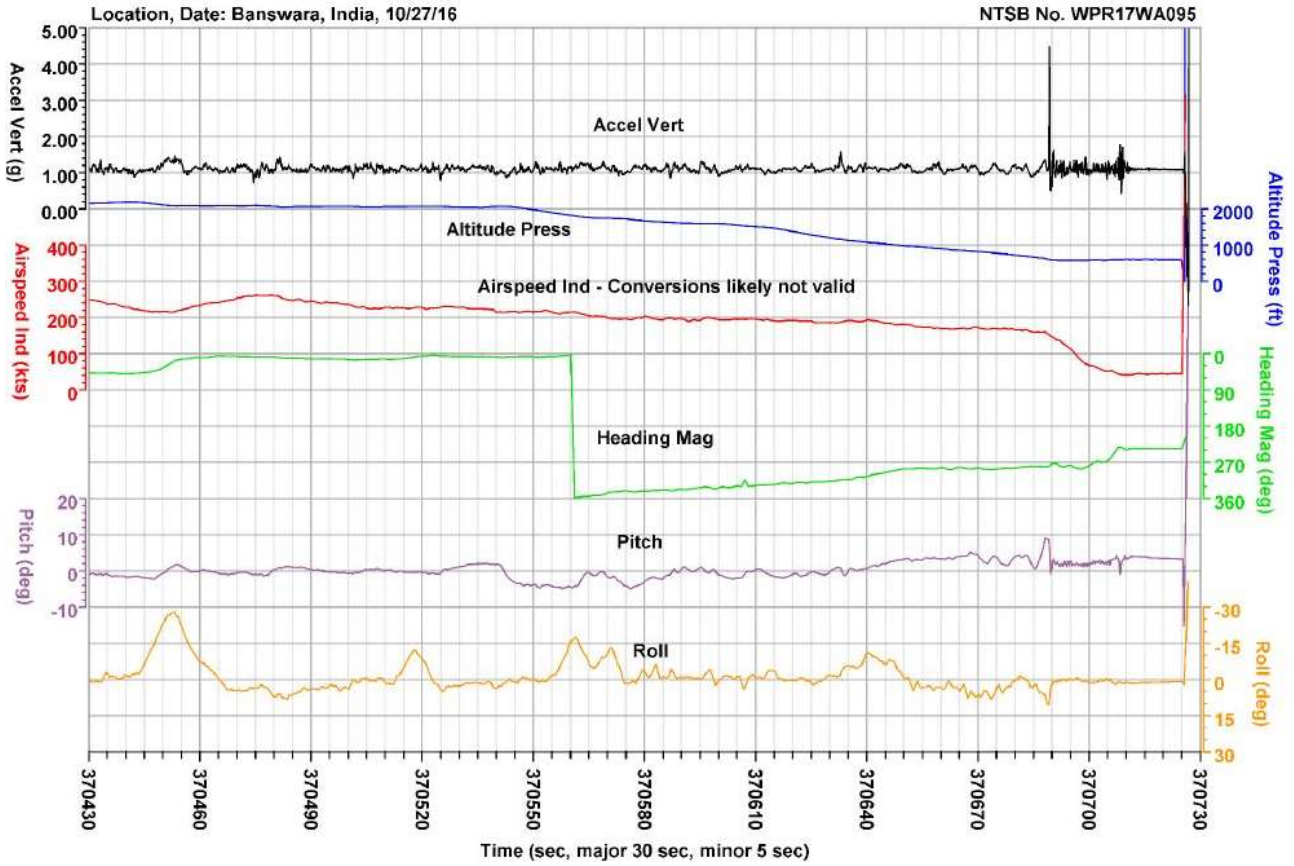
After the aircraft was ferried to Delhi for repair and CVR recording from the ferry flight was obtained by the COI. The CVR was again found serviceable and recordings from ferry flight was checked and found satisfactory.

The CVR is required to be checked for serviceability once a year as per the CAR Section 2, Series I, Part VI prevalent on day of incident. The last check was done in July 2016 and was satisfactory. Further CVR recording from the aircraft was last downloaded as per the prevailing DGCA regulations for FOQA monitoring program on 06th Oct 2016 at 1100 Hrs as per the maintenance records.

This recording was analyzed by operator and contained the recording of a flight operated on 05.10.2016 as per the operator's FOQA report. The next flight was operated on 11.10.2016 and neither this flight nor any other flight after this was recorded in the CVR. Aircraft operated 30 flights after last download till incident flight.

1.11.2 DFDR

DFDR removed from aircraft was downloaded at a DGCA approved facility in New Delhi. The raw data from the DFDR was sent to NTSB for conversion into engineering parameters. NTSB provided factual report on the DFDR. The Plots of DFDR data provided by NTSB are as follows.



As per the report and plot above, during the final portion of the approach, the aircraft was in a steady left turn until it lined up on the runway heading about 400 ft above the touchdown altitude. Upon touchdown at time 370688 seconds (DFDR Elapsed Time), the aircraft was rolled to the right about 10 degrees. Vertical acceleration reached recorded peaks of 4.47 G and 0.51 G when the aircraft touched down. The aircraft then deviated to the left and the recording ended about 30 seconds after touchdown.

1.12 Wreckage and impact information

The aircraft touched down on its RH wheel first at a distance 10.7 m from the threshold. The LH wheel touched further 07 m ahead and burst on landing. A deep scrape mark on runway was observed at the point of impact of LH wheel. The aircraft started deviating to left after rolling for about 100 m. The aircraft track after touchdown is reproduced in figure below based on the tyre marks on the runway.

The aircraft exited the runway at an angle of about 20° with runway at a distance of about 500m from the threshold. The RH wheel of aircraft was 20 meters from runway edge when it came to halt and aircraft had travelled around 50 meters on unpaved surface. There was no sign of disintegration of any part of the aircraft in air.

Final resting position of the aircraft

1.13 Medical and pathological Information:

The crew had undergone breath analyser test at Ahmedabad on 27.10.2016 prior to flight as require by the prevalent CAR Section 5 Series F, Part III. The test was satisfactory. The passengers and crew did not receive any injury in the incident.

1.14 Fire:

The Fire Tenders and Ambulance were arranged by the district administration for the flight and were available at the time of landing. However, there was no fire reported on aircraft.

1.15 Survival aspects: The incident was survivable

1.16 Tests and research:

As per the Tyre Inspection Procedure provided by the manufacturer, tyres are required to be inspected for treads visually. The tyres should be removed "*when the tread has worn to the base of any groove at any spot, or upto 1/8 of the tyre circumference. In order to return to maintenance base , tyres can remain in service with the top ply cord visible, but only as long as the cord is not worn through or exposed for more than 1/8 of the circumference of the tyre or not more than 1 inch wide at the fastest wearing location."*

The LH tyre of the aircraft had burst at the time of incident. The RH tyre and the LH tyres were removed from the aircraft and replaced with serviceable tyres. Both main wheel tyres were brought to AAIB for inspection. Since the aircraft tyre had burst and could not be inflated for inspection, measurement of serviceable tyre treads in inflated and deflated condition was carried out for comparison, to assess if the tyres were in good condition at the time of departure of incident flight.

It was seen from the measurements that there is 3.693 % average reduction in tread depth when the tyre is inflated at recommended pressure vis-a-vis tyre in deflated condition.

The measurement of the treads on the removed tyres was also carried out, using the manufacturer's inspection procedure as guideline. The reduction factor

(3.693%) was used to determine the tread depth that would have existed on the tyres before they were damaged in the incident flight. The details of tread depth measurements at various points on the damaged tyres are as below.

LH Tyre tread measurement in inches		**RH Tyre tread measurement in inches**	
Tread Measurement	**Possible Value in inflated condition (Using 3.693% Reduction factor)**	**Tread Measurement**	**Possible Value in inflated condition (Using 3.693% Reduction factor)**
0.160	**0.154**	0.255	**0.246**
0.145	**0.140**	0.115	**0.111**
0.155	**0.149**	0.080	**0.077**
0.102	**0.098**	0.050	**0.048**
0.085	**0.082**	0.140	**0.135**
0.150	**0.144**	0.118	**0.114**
0.133	**0.128**	0.090	**0.087**
0.060	**0.058**	0.041	**0.039**
0.155	**0.149**	0.130	**0.125**
0.155	**0.149**	0.125	**0.120**
0.145	**0.140**	0.086	**0.083**
0.047	**0.045**	0.025	**0.024**
0.134	**0.129**	0.155	**0.149**
0.135	**0.130**	0.123	**0.118**
0.105	**0.101**	0.091	**0.088**
0.045	**0.043**	0.031	**0.030**
0.043	**0.041**	0.016	**0.015**
0.045	**0.043**	0.026	**0.025**

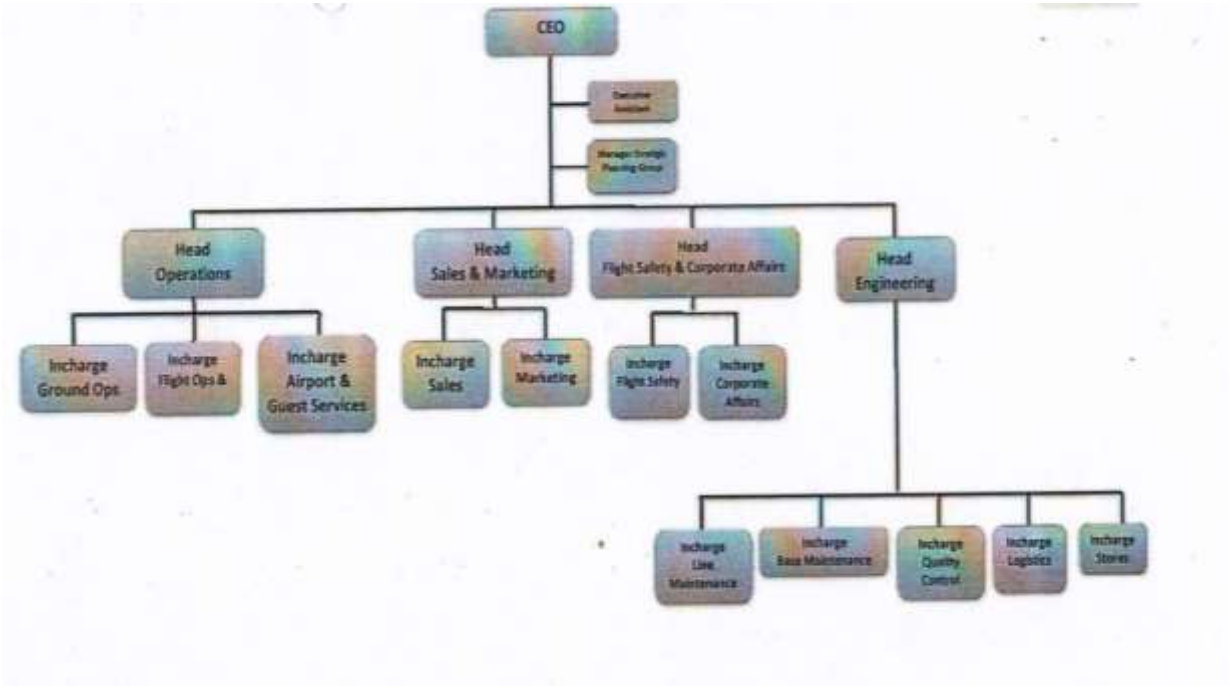
From the above measurements, it is inferred that the tyre was not in good condition before take-off for the incident flight. The tread depth was close to zero at various spots. The treads were significantly worn out, specifically on the inner sides.

Post Incident condition of LH tyre

Post Incident condition of RH tyre

1.17 Organizational and management information:

M/s A R Airways Pvt. Ltd. is a Non-Scheduled Air transport operator engaged in charter operations. The operator is having Non- Scheduled Operating Permit (NSOP) No. 01/2005 and the same was valid on the day of incident. The operator has 02 Cessna Citation 560XL, 02 Cessna Citation 550, 02 Falcon-2000, 01 Cessna Citation S-II, 01 Cessna Citation - II, 01 Cirrus SR-20 and 01 CRJ-100 registered in its name as per the the permit. The head office of the operator is at Delhi. Being a non-scheduled operator, the area of operations are based on as & when required basis all over the country and neighbouring countries. The operator has in-house CAR 145 maintenance approval.



Organizational Chart of the operator

As per the DGCA approved operations manual of the operator, the CEO has the overall responsibility to manage the affairs of the company. The CEO is assisted by the Chief Pilot, In-charge Ground (Ops) & Security, Chief of Flight Safety, VP Engineering and QA/QCM.

In addition to the Maintenance and Operations Departments, the Organisational Chart shows one independent department i.e., Flight Safety. The operator has a flight safety manual approved by DGCA on 29.07.2016. During scrutiny of the flight safety manual, it was observed that the operator did not incorporate any contact information

of AAIB for notifying any reportable occurrences to AAIB as per the requirement laid in Aircraft (Investigation of Accidents & Incidents) Rules 2012 and CAR Section 5 Series C, Part I. Also, in many places, it was observed that the terms like Inspector of Accidents, etc. which correspond to omitted investigation rules of Aircraft Rules 1937, were used.

1.18 Additional information

1.18.1 Regulation on notification of occurrences

DGCA had issued a CAR Section 5 Series C, Part I regarding notification of incidents and investigation thereof. As per the CAR which was prevalent on the day of incident *"It is incumbent that the notice and information of occurrences as listed in Appendix "A" in the prescribed format shall be sent as soon as possible by the quickest means available and in any case within 24 hours by the person in command of the aircraft or if he be killed or incapacitated the owner, operator, the hirer or other persons on whose behalf he was in command of the aircraft/ Airport Director/ATC In charge/Communication In charge/Aerodrome In charge/Safety Investigation Coordinator (SIC) In charge to the Director General of Civil Aviation (Attn: Director Air Safety, HQ) and the concerned Regional Air Safety Office(s) where the Operator is based and where the location of the occurrence falls. In addition the information regarding incident / accident shall also be provided to Aircraft Accident Investigation Bureau (AAIB). Operator shall develop a procedure for reporting of occurrences and include in their Flight Safety Manual/Safety Management System Manual/Airport Emergency Planning Manual."*

As per the Rule 4, para 1 of Aircraft (Investigation of Accident and Incident) Rules, 2012 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, 2012 *"The notification as required in sub-rule (2) shall also be submitted to the Bureau by the concerned –(a) aerodrome operator;(b) officer-in-charge of air traffic control unit and the watch supervisory officer of air traffic control; and (c) regional or the sub-regional officers of the Directorate General of Civil Aviation."*

The notification of the incident to AAIB was neither sent by the operator nor DGCA.

DGCA approved flight safety manual of the operator did not require the incident to be notified to AAIB and contact details of AAIB were not available in the manual.

1.18.2 Regulations on Aerodrome

Banswara airport is an unlicensed airport. The airport is categorized as *State Govt. Aerodrome not necessarily maintained in serviceable condition* in the AIC 18/1986 issued by DGCA. As per the AIC 18/1986

"It is the responsibility of pilot to satisfy himself-

(i) That the aerodrome which is to be used for landing or departure is suitable in all respects and will not is any way jeoparadize the safety of aircraft or any person; and

(ii) That he is able to comply with requirement laid down in the Indian Aircraft Rules, 1937"

DGCA has also issued a CAR Section 4 Series B Part VI under Rule 78 of the Aircraft Rules, 1937 regarding minimum safety requirements for temporary and unlicensed aerodrome. As per Para 3.1 of the CAR,

"Runway: Runway should be capable of withstanding the traffic requirement for aeroplanes the runway is intended to serve.

The physical condition of the runway surface should be free of irregularity, pot holes so that not to cause damage to the aircraft. There should be level and graded area sufficient to provide safeguard and minimize damage in case of runway excursions, beyond the runway limits in lieu of runway strips. In case of operations of aircraft having AUW more than 5700 kgs, it is desirable that runway strength is available in terms of PCN."

The maximum AUW for VT-KMB as per CoA is 6849 Kg. However, the strength of runway in terms of PCN was not available with the District Administration or with operator. The flight was operated without any information on strength of runway.

1.19 Useful or effective investigation techniques: NIL

2. ANALYSIS

2.1 Serviceability of the aircraft:

The aircraft had a valid certificate of airworthiness on the date of incident. The last major inspection on the aircraft was carried out in April 2016. Aircraft did not have any pending snag and was neither operating under any MEL.

Both engines were serviceable and did not have any pending snags. Aircraft was maintained as per the approved program and was airworthy on the date of incident. The aircraft had clocked 4326:20 Hrs as on day of incident.

The LH tyre was last replaced on the aircraft on 13.12.2015 and RH tyre was last replaced on 09.11.2015.

The examination of tyres carried out at AAIB revealed that the tyre were not in good condition at the time of departure of incident flight. Therefore it can be

presumed that the AME and the flight crew were not performing the pre-flight checks meticulously.

Serviceability of the aircraft was a factor to the incident.

2.2 DFDR Analysis:

The DFDR unit of the aircraft was removed from the aircraft and raw data was downloaded at a DGCA approved facility in presence of COI.

The raw data from the DFDR was sent to NTSB for conversion into engineering parameters. NTSB provided factual report on the DFDR. The Plots of DFDR data provided by NTSB are provided at Para 1.11.2.

As per the report *"During the final portion of the approach, the aircraft was in a steady left turn until it lined up on the runway heading about 400 ft above the touchdown altitude. Upon touchdown at time 370688 seconds, the aircraft rolled to the right about 10 degrees. Vertical acceleration reached recorded peaks of 4.47 g and 0.51 g when the aircraft touched down. The aircraft then deviated to the left and the recording ended about 30 seconds after touchdown."*

Such high value of vertical acceleration at the time of touch down suggests heavy landing followed immediately by a tyre burst.

2.3 CVR Analysis:

The CVR of the aircraft was downloaded at DGCA's CVR Lab facility in the presence of CoI. Recording of 02:02:51 Hrs was available in the CVR. However, this recording did not pertain to the incident flight. The CVR recording contained voices from some maintenance activity carried out on the aircraft earlier to the flight. The serviceability of CVR was therefore checked on ground and also by downloading the CVR from ferry flight post incident and CVR was found to be serviceable.

Analysis of voices in CVR, maintenance records, flying records and interview of crew and maintenance personnel was carried out to find out the reason for non-availability of incident flight recording.

The last CVR download on aircraft was carried on 06.10.2016 at 1100 hrs as per the maintenance records. The last flight operated by the aircraft before this download was on 05.10.2016. And the immediate flight operated by the aircraft after this CVR download was on 11.10.2016.

The recording downloaded from CVR on 06.10.2016 contained the recording of flight operated on 05.10.2016 as per the CVR analysis report and was satisfactory.

It can therefore be concluded that the CVR switch was switched off during the maintenance activity carried out between 06.10.2016 and 11.10.2016. The aircraft had operated 30 flights after the last CVR download till the date of incident. The crew never switched "ON" the CVR CB during these flights, even though crew is required to check, if all cockpit CBs are set in correct position. Therefore, it is evident that the flight crew was not carrying out pre-flight checks meticulously.

2.4 Weather:

The weather for Udaipur airport which is the nearest airport having weather facility was obtained by the crew. The weather was good and was not a contributory factor in incident.

2.5 Flight Planning:

Banswara airfield is an uncontrolled airport not necessarily maintained in serviceable condition as per DGCA AIC 19/1986. Operator is required to obtain prior permission to operate flight to Banswara from Directorate of Civil Aviation, Govt. of Rajasthan.

The operator had obtained permission for the flight on 24.10.2017. As per para 3.1 of CAR Section 4, Series B, Part VI the operator is required to check the runway

strength in PCN before operating flight by aircraft with AUW greater that 5700 Kg. No such information was available with operator or the district authorities even though the aircraft AUW was 6400 Kg.

2.6 Notification of Incident:

Operator was required to notify the incident to AAIB as per CAR Section 5 Series C, Part I but did not do so. The notification of the incident was sent only to the DGCA.

As per Aircraft (Investigation of Accident and Incident) Rules, 2012, DGCA was also required to forward the notification received from operator or any source to AAIB, however the same was also not done.

The Flight Safety Manual and SMS Manual of the operator approved by DGCA did not contain any requirement for the operator to notify incident to AAIB. There were various mistakes and discrepancies noticed in the Flight Safety Manual.

Both the operator and DGCA did not notify AAIB about the incident.

3. Conclusions

3.1 Findings

1. The Certificate of Airworthiness, Certificate of Registration and CRS of the aircraft was valid on the date of incident.
2. The CG of the aircraft was within the prescribed limits. There was no snag reported on the aircraft prior to the incident flight.
3. Aircraft tyres were not in serviceable condition on the day of incident.
4. Aircraft was primarily based in Surat.
5. As per DGCA 18/1986, Banswara airport is a State Govt. Aerodrome not necessarily maintained in a serviceable condition.
6. There was no navigational aid available at Banswara Aerodrome. Only wind sock was installed to provide information about winds.

7. No information about strength of runway was available with A R Airways before operating the flight.
8. The District Administration also did not have information about strength of runway in terms of PCN.
9. The aircraft crew were not carrying out the pre-flight checks meticulously.
10. The CVR did not contained the recording of incident flight.
11. Aircraft operated 30 flights before the incident with the CVR CB in off condition.
12. Aircraft made a hard landing at Banswara.
13. LH tyre of the aircraft burst and caused the aircraft to lose track and exit the runway.
14. Aircraft exited the runway on left after travelling approximately 520 meters.
15. There was no injury to any of the occupants and there was no fire during the incident.
16. The weather at the time of landing at Banswara was fine.
17. The incident was not reported immediately to AAIB by the operator or DGCA.
18. The Flight Safety Manual approved by DGCA did not contain any requirement for the operator to notify reportable occurrences to AAIB.
19. The information about airfields provided in AIC 19/1986 is outdated.

3.2 Probable cause of the Incident

Incident was caused due to tyre burst, which resulted in aircraft veering out of runway.

Not carrying out proper pre-flight checks, poor condition of tyre and hard landing contributed to the incident.

4. Recommendations

4.1 DGCA should conduct a Safety Audit of the operator (M/s A R Airways) in order to assess the maintenance practices followed by them, at their outstation locations.

4.2 DGCA should ensure that Ops Manual, Flight Safety Manual and SMS Manuals etc. of all airline and aerodrome operators carry correct contact details of AAIB for notification of incidents and accidents.

4.3 DGCA should update AIC 19/1986 to provide latest details of airfields to airline operators and also ensure that information on runway strength is made available to the airline operators, wherever required.

4.4 DGCA should ensure that, the flight crew is counselled by the operator to carry out the pre-flight checklists in a meticulous manner without fail.

Jasbir Singh Larhga
Chairman, Committee of Inquiry

K. Ramachandran
Member, Committee of Inquiry

Date: 14.12.2018

Place: New Delhi