FINAL REPORT ON ACCIDENT TO M/s DECCAN AVIAION PVT, LTD., PC-12/45 AIRCRAFT VT-DAR AT GUWAHATI ON 28-11-2014

1.	Aircraft Type	: PC-12/45
	Nationality	: INDIAN
	Registration	: VT - DAR
2.	Owner	: Deccan Aviation Ltd., Bangalore
3.	Operator	: Deccan Charter Pvt. Ltd., Bangalore
4.	Pilot – in –Command	: CPL holder Licence (Endorsed on type)
	Extent of injuries	: Nil
5.	Co - Pilot	: CPL Holder Licence (Endorsed on type)
	Extent of injuries	: Nil
6.	Place of Accident	: Runway 02, Lokapriya Gopinath Bordoloi International Airport, Guwahati, Assam
7.	Date & Time of Accident	: 28th Nov 2014, 13:21 UTC
8.	Last point of Departure	: Delhi
9.	Point of intended landing	: Lokapriya Gopinath Bordoloi International Airport, Guwahati, Assam
10.	Type of operation	: Non-Scheduled Operation
11.	Passengers on Board	: 01
	Extent of injuries	: Nil
12.	Phase of operation	: Landing
13.	Type of Accident	: Bounced Landing
14.	Geographical Location of Accident	: Rwy 02 at Guwahati Airport

(ALL TIMINGS IN THE REPORT ARE IN UTC)

SUMMARY

M/s Deccan Aviation Pvt. Ltd, PC-12/45 aircraft VT-DAR operating flight from Delhi to Guwahati was involved in an accident during landing at Guwahati airport on 28-11-2014. There were 02 crew members and 01 passenger on board the aircraft.

The flight departed from Delhi at 1018 Hrs UTC to Guwahati. The enroute flight and the final approach for Guwahati was uneventful. The aircraft made ILS approach for Runway 02 at Guwahati. The autopilot was disconnected at decision height and subsequently flown manually for landing. During landing at around 1321 UTC the aircraft bounced twice and after the subsequent bounce landed on the nose landing gear. The nose gear broke and sheared off from the attachment after the impact and the propeller came in contact with the run way surface creating spark and smoke on the runway. The aircraft dragged on the runway and finally came to halt on the runway. Both the pilots and the passenger evacuated the aircraft safely. There was no fire.

The Sole objective of this investigation is not to blame or apportion liability on anyone and it is to prevent the recurrence. The committee was of the opinion that the accident occurred as the PIC possibly lowered the aircraft attitude to control pitch in this process the aircraft landed on its nose landing gear which eventually resulted into the accident.

The Ministry of Civil Aviation constituted a committee of inquiry to investigate into the cause of the accident under Rule 11 (1) of Aircraft (Investigation of Accidents and Incidents), Rules 2012 comprising of Sh. A X Joseph, Deputy Director AAIB as Chairman and Capt. Kishore Chinta as operational member vide order No. AV.15018/06/2014-DG dated 23.02.2015.

1. FACTUAL INFORMATION

1.1 History of the flight

M/s Deccan Aviation Pvt. Limited, Pilatus PC-12/45 aircraft VT-DAR operating charter flight Delhi-Guwahati was involved in an accident during landing at Guwahati airport on 28/11/2014. The aircraft was under the command of Pilot in Command (PF) along with the Co-pilot (PM). Both the crew were holding valid Commercial Pilot Licence (CPL) with duly endorsed PIC rating of the aircraft type. There was 01 passenger on board the aircraft.

Prior to the accident, on the previous day the aircraft had operated flight Guwahati-Delhi. The AME had carried out daily inspection schedule at Guwahati and released the aircraft for flight. The flight was uneventful and aircraft landed safely at Delhi. There was no snag reported on the aircraft after landing at Delhi. The aircraft VT-DAR was scheduled for operation on 28/11/2014 for flight Delhi-Guwahati. Prior to release of aircraft from Delhi to Guwahati the duly qualified AME had carried out daily inspection schedule on the aircraft and released the aircraft for flight. There was no MEL invoked on the aircraft. There was no snag on the aircraft prior to flight.

The aircraft took off from Delhi at time 10:18 UTC. During climb to FL110, a AIR/ GD warning light came "ON" on Caution And Warning System (CAWS) panel along with Master Caution Red. Both the crew carried out actions as per Aircraft Flight Manual. The crew discussed the situation and decided to continue with the flight. The associated system with the warning were monitored during the flight by the crew.

Prior to landing, the enroute flight was uneventful and while approaching Guwahati, the Air Traffic Control (ATC) radar vectored the aircraft for ILS runway 02. The ATS controller instructed VT-DAR to descent to 3500 Ft on QNH 1011 and heading 060 to intercept the localizer for ILS runway 02. At 03 Nm to touch down the crew configured the aircraft for landing with landing gear down and selected full flaps before

intercepting the glideslope for landing. The crew maintained airspeed of about 95-100 KIAS during final approach. The autopilot was disconnected at decision height around (DH) 350 Feet above touch down and thereafter the aircraft was flown manually for landing by the PIC.

As per the PIC statement, the aircraft landed on its main landing gears and bounced back in air. The aircraft again bounced for the second time after touch down. At this stage the first officer asked PIC to take over controls to which the PIC replied saying he has the controls. The PIC further mentioned that he was maintaining the direction control holding the stick however the aircraft pitch kept on increasing at low height. The PIC attempted to land the aircraft however the aircraft pitched down abruptly and the aircraft landed on the nose gear. Subsequently the propeller came in contact with the runway surface and thereafter the aircraft skidded on the runway on its nose and came to halt just after the intersection of taxiway E to the runway. Both the pilots and the passenger evacuated the aircraft safely.

The tower observed spark during landing roll. The controller activated the fire station immediately and tried repeatedly to contact the aircraft however there was no reply as the crew had evacuated the aircraft. The fire personnel reached the aircraft immediately and sprayed foam around the nose landing gear area as smoke was visible. The hydraulic fluid was observed on the runway surface. There was no injury to any of the occupant on board the aircraft. There was no fire.

1.2 Injuries to persons

INJURIES	CREW	PASSENGERS	OTHERS
FATAL	Nil	Nil	Nil
SERIOUS	Nil	Nil	Nil
~~MINOR~~/ NONE	02	01	-

1.3 Damage to Aircraft

The aircraft sustained the following major damages.

1. After the impact the Nose wheel sheared from the shock absorber along with the fork assembly.
2. All the four propeller blades hit the runway surface and got bent from the middle and the tips had worn off due to friction on the runway.
3. With the engine impact on the runway, the Engine fuel pump and FCU had broken off from its mounting and the bolts shear off after the impact.
4. Generator 2 assembly housing broken due to heavy impact.
5. Starter / Generator cooling duct has struck on the TCV cover causing bending it.
6. Left flap inboard trailing edge skin got minor damage.

Final resting position of the aircraft on the runway with nose landing gear broken off

7. The fuel condition lever were found stuck at ground idle position as FCU had broken and came out from its original position.
8. Crack and kinks were found on frame number 12.
9. Wrinkle on the skin found on both side nose gear doors.
10. Cracks visible on starter generator mounting.
11. The RH NLG door was damaged.
12. Following parts of nose landing gear found broken-
    a) Fork broken from both sides.
    b) Torque link broken from middle and bottom joint.
    c) Spring strut broken from both ends and found on runway.
    d) Drag link bottom linkage broken form middle.

1.4 Other damage: The runway surface had deep gouging marks on the runway made by the axle of the nose landing gear.

1.5 Personnel information

1.5.1 Pilot – in – Command

AGE	:	37 years
License	:	CPL Holder
Category	:	Aeroplane
Class	:	Multi engine land
Endorsements as PIC	:	Cessna 172, P-68C, PC-12
Date of Med. Exam.	:	07-07-2014
Med. Exam valid up to	:	06-07-2015
FRTO License	:	Valid
Total flying experience	:	1648 hours
Experience on type	:	179:05 hours
Experience as PIC on type	:	61:15 hours
Last flown on Type	:	Pilatus PC-12

Total flying experience during last 180 days	:	179:05 hours
Total flying experience during last 90 days	:	131:50 hours
Total flying experience during last 30 days	:	57:35 hours
Total flying experience during last 07 Days	:	Nil
Total flying experience during last 24 Hours	:	Nil

1.5.2 Co-Pilot

AGE	:	39 years
License	:	CPL Holder
Category	:	Aeroplane
Class	:	Single engine Land and Multi engine Land
Endorsements as PIC	:	C-172, C-152, P-68C, PC-12 and B-200
Date of Med. Exam	:	23-01-2014
Med. Exam valid upto	:	22-01-2015
FRTO License	:	Valid
Total flying experience	:	4373 hours
Experience on type	:	2723 hours
Experience as PIC on type	:	1720 hours
Last flown on Type	:	Pilatus PC-12
Total flying experience during last 180 days	:	161:40 hours
Total flying experience during last 90 days	:	92:25 hours
Total flying experience during last 30 days	:	26:50 hours
Total flying experience during last 07 Days	:	15:10 hours
Total flying experience during last 24 Hours	:	04:50 hours

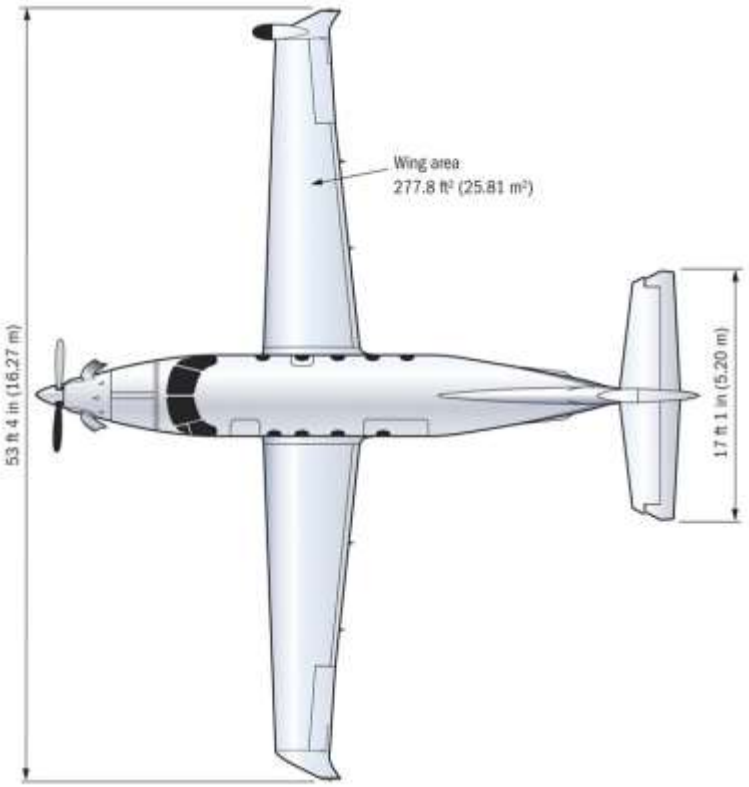
(03 Hrs and 15 minutes of flying time for the accident flight is not taken into account for the above flying experience for both the operating crew)

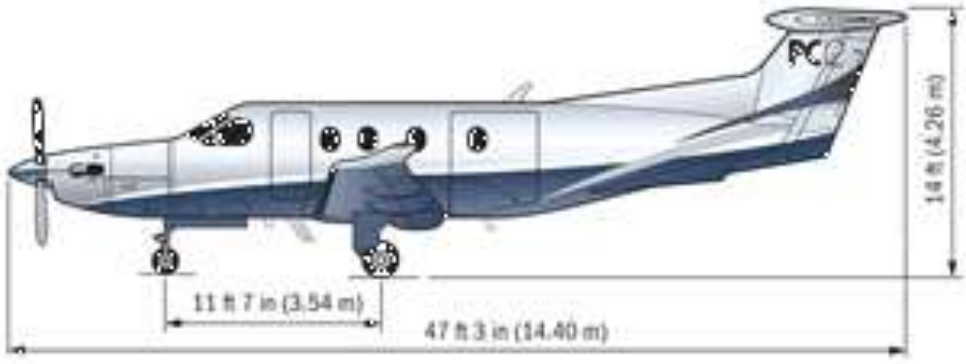
Both the operating crew were not involved in any serious incident/ accident in the past. They were current in all ancillary training and had adequate rest prior to

roster for the accident flight. The crew combination and rostering for the flight involved in the accident was in compliance with M/s. Deccan Operations Manual requirements.

1.6 Aircraft Information

The airplane is a low wing, T-tail configuration, single engine, retractable landing gear type designed to transport passengers, cargo, or various combinations of both passengers and cargo. The aircraft is designed for operation with two pilots and has passenger seating capacity of 09. Construction is conventional semi-monocoque, primarily incorporating aluminum alloy, but composite structure are used in certain areas.





The fuselage consists of the engine area, nose gear assembly, cockpit, cabin, and aft fuselage. The engine area contains the power plant, and associated accessories. The engine cowling is constructed from a carbon/nomex honeycomb material while the engine mount is welded steel tubing and bolted to the firewall in four places. The firewall is titanium and protected by insulation material. A two piece windshield, two side windows and a direct vision (DV) window provide cockpit visibility. The two piece windshield is glass while the two side windows and the DV window are stretched

acrylic. Airplane avionics are mounted under the cabin floor, running the length of the center cabin, and are accessible through quick release panels. The wings are of conventional construction incorporating front and rear spars, ribs, and skin. Each wing has a main landing gear attached to the front and rear spar, with a carbon fiber/nomex honeycomb gear door attached to the leg. The flight control system is conventional using push-pull rods and carbon steel cables. Electric trim systems are provided for the aileron, rudder, and elevator. The PC-12 is equipped with a stickshaker/ stickpusher system that prevents the aircraft from entering an aerodynamic stall.

Aircraft VT-DAR (MSN 251) had been manufactured in year 1999. The aircraft was registered with DGCA under the ownership of Deccan Charters Private Limited. The aircraft is registered under Category 'A' and the Certificate of registration No. 3057/6.

The Certificate of Airworthiness Number 2466 under "Normal category" subdivision Passenger / Mail / Goods was issued by DGCA on 17.09.2001. The specified minimum operating crew is one and the maximum all up weight is 4500Kg. At the time of accident the Certificate of Airworthiness was current and was valid till the validity of ARC ie. 24.06.2015.

The Aircraft was holding a valid Aero Mobile License No A-348/08 at the time of accident. This Aircraft was operated under Non Scheduled Operator's Permit No 26/2008 which was valid up to 06.10.2016. As on 28.11.2014 the aircraft had logged 7585:00 Airframe Hours and 5378 landings.

Engine and propeller details:

The aircraft PC-12/45 is fitted with Engine Model- P&W PT6A-67B (turbo Prop. engine), Sl. no.-PCE-PR-0108.

Engine specifications:

Max continuous & Take off : 1200 SHP

Engine Time Since New (TSN) :7159.12

Time Since Overhaul (TSO) :147.54

Engine was last overhauled : 14-04-2014. At TSN 7011:18 H

There was no snag/defect reported on the engine.

Propeller Specifications:

Propeller Model :HC-E4A3D/E10477K, Sl. no.- KX298

Propeller :1700 RPM

Time Since New (TSN) :3407.12

Time Since Overhaul (TSO) :147.54

The Pilatus PC 12/45 aircraft and its Engine are being maintained as per the maintenance program consisting of calendar period/ flying Hours or Cycles based maintenance as per maintenance program approved by Regional Airworthiness office, Bangalore.

Accordingly, the last major inspection 100 Hrs inspection was carried out at 7539:00 Hrs on 18.09.2014. Subsequently all lower inspections (Preflight inspection, other Out of Phase Inspection) were carried out as and when due before the accident.

The aircraft was last weighed on 20.06.2014 at M/s Deccan Charters Pvt Limited facility, New Delhi and the weight schedule was prepared and duly approved by the office of DDG, Northern Region. As per the approved weight schedule the Empty weight of the aircraft is 2805.5 Kg. Maximum Usable fuel Quantity is 1226.4 Kg. Maximum All Up weight of the aircraft is 4500 Kg.

Empty weight CG is 5.88 meters aft of datum. As there has not been any major modification affecting weight & balance since last weighing, hence the next weighing was due on 20.06.2019. Prior to the accident flight the weight and balance of the aircraft was well within the operating limits.

All the concerned Airworthiness Directive, mandatory Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engine has been complied with as on date of accident.

Pre-flight and Post flight inspections are carried out as per approved task cards and other higher inspection schedules including 100hrs inspection as per the manufacturer's guidelines as specified in Maintenance Program and are approved by the Continuing Airworthiness Manager (Post Holder for Continuous Airworthiness).

The last fuel microbiological test was done on 12.05.2014 at Chennai by Indian Oil Company and the colony count was within acceptable limits.

1.7 Meteorological information

At the time of landing, the weather was, visibility of 3500 meter in a calm wind condition at a temperature of 21^{o} C and with no significant weather change.
The following weather was reported by ATC.

Wind	:	000/00 knots
Visibility	:	3500 m
Weather	:	BR
Clouds	:	Few 2000 Ft, BKN 10000 Ft
Temperature	:	21^{0} C
Dew pt	:	18^{0} C
QNH	:	1012 hPa
Trend	:	No significant Weather Change

1.8 Aids to navigation

There is one runway available at Lokapriya Gopinath Bordoloi International Airport, Assam which has the orientation 02/20. The VOR, DME and ILS facility is available for both the approaches for runway 02/20. PAPI is also available on both sides of the runway.

1.9 Communications

There was always two way communication between the ATC and the aircraft.

1.10 Aerodrome information

Figure showing Lokapriya Gopinath Bordoloi International Airport, Assam

ICAO code: VEGT

Co-ordinates

ARP : 260618N 0913508E

Elevation : 162.0 feet Above Mean Sea Level (AMSL).

Runway Orientation and dimension

Orientation- 02/20 Dimension 3103 x 45 meters

R/W & Taxi Tracks Markings Standard as per Annex- 14

Approach and Runway Lighting

RWY.	HIALS (APCH LGT)	THR LGT	PAPI	Rwy Centre Line LGT	HIRL (RWY edge LGT)
02	CAT-I	Yes	Yes (3.25^{o})	No	Yes

Met Services

MET services are available at the airport. TAF, Trend Forecast and Briefing is available.

Navigation and Landing Aids

VOR, DME and ILS

ATS Communication Facilities

Guwahati ATIS	126.60 MHZ
Guwahati Approach	120.50 MHZ
Guwahati Tower	122.30 MHZ
Guwahati Ground	121.90 MHZ

1.11 Flight recorders:

The Cockpit Voice Recorder (CVR) and the Digital Flight Data Recorder (DFDR) are neither fitted nor required on this aircraft as per the existing Civil Aviation Requirements.

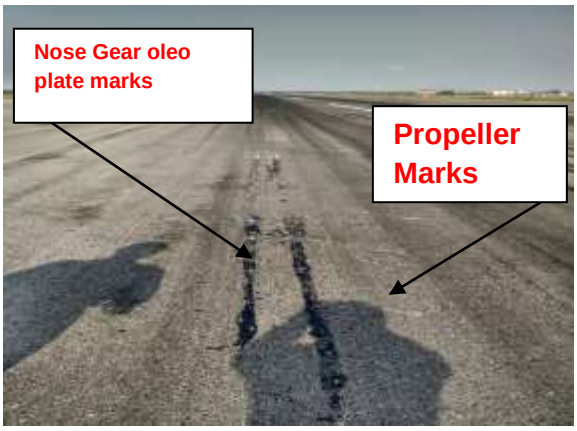
1.12 Wreckage and impact information

Figure: Location of aircraft and parts on the runway after landing.

During landing the aircraft bounced twice on its main landing gear and on the third time the aircraft impacted on its nose landing gear. The impact was such that the nose gear sheared off from its attachment point and the bend backward.

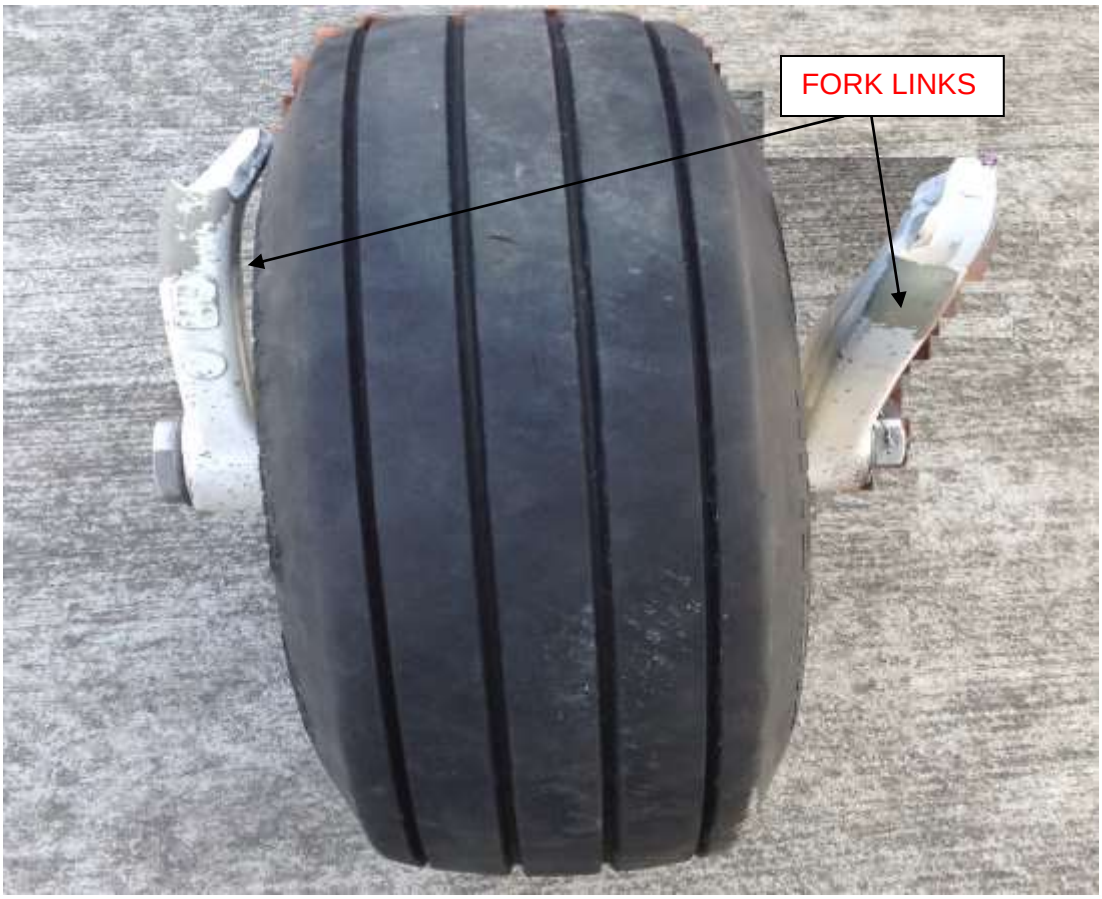
NOSE LANDING GEAR BENT BACKWARD

The nose wheel also got detached form the wheel assembly, and the propellers came in contact with the runway surface as it is evident with the propeller marks on the runway surface. After the nose wheel detached from the hub the oleo of the nose gear came in contact with the runway surface as it is evident from the deep gourge marks on the runway surface and also on the nose landing gear.



BENT PROPELLER BLADES

The intensity of the impact on the nose gear on the runway was so strong that both the fork link of the nose wheel broke due to impact on the runway. The nose wheel went away and the propeller hit the runway surface at about 1020 metres from threshold.



BOTH THE FORK LINKS BROKE DUE IMPACT

Thereafter the aircraft dragged on the runway for about 519 metres. The aircraft came to halt just after taxiway 'E' approximately 1539 metres from the threshold.

Generator mounting studs broken.

Generator casing rupture due impact

Hydraulic leakage on the runway surface

During subsequent inspection it was observed that the AC generator mounted on the engine its cast iron casing had cracked at two locations and also the aircraft frame number 12 had cracked due impact. The hydraulic fluid lines had ruptured and the hydraulic fluid had leaked and spread on the runway surface.

1.13 Medical and pathological Information

Prior to flight from Delhi both the pilots had under gone the pre-flight medical Breath analyser test at Delhi and same was found negative. After the accident both the crew were again subjected to Breath analyser test at Guwahati and same was negative.

Post-accident there was no injury to any of the occupant on board the aircraft.

1.14 Fire:

After the nose landing gear sheared off, the nose oleo came in contact with the runway surface. Sparks and smoke were visible during landing roll due to the friction with the runway surface, however there was no fire.

1.15 Survival aspects

The accident was survivable.

1.16 Tests and research

1.16.1

The damaged parts of nose landing gear of aircraft VT-DAR were sent to DGCA laboratory for detailed examination and to ascertain into the nature of the failure of the parts.

Visual & Macro Examination: Failed parts were examined under the stereomicroscope up to a magnification of 50X.

Left and Right fork:- Left & right fork were examined on the microscope. The left fork was found twisted and the fracture surface was observed to be slant & fibrous. On the other end, bore (Inner diameter) and face condition were found satisfactory. Right fork was also found twisted with fracture surface having slant and fibrous appearance.

Figure shows nose wheel fork (right and left) parts

i) Link torque (Upper Part & Lower Part):

Link torque upper and lower part Fracture surfaces of both the parts are found dull and fibrous.

Figure shows lower and upper part of torque link

ii) Spring Pack Assembly & Drag Link Assembly:-

Spring pack assembly and drag link assembly were found twisted and fracture surfaces were found dull and fibrous.

Figure shows drag link assembly, spring pack assembly and bearing rod end

iii) Bearing rod end of spring strut:-

Fracture surface of bearing rod end was found dull & fibrous.

Figure shows part spring pack assembly and drag link assembly with rubbing marks

Observation

The presence of slant and fibrous fracture surface along with twisting features on the left and right fork indicate that the components have failed under overload conditions. Presence of dull and fibrous appearance on the fracture surface of remaining failed parts i.e. link torque upper and lower part, spring pack assembly & drag link assembly and bearing rod end of spring strut also indicates failure due to overload.

1.16.2 The involved engine was transported to P&W facility for defect investigation. Following observations were made during investigation.

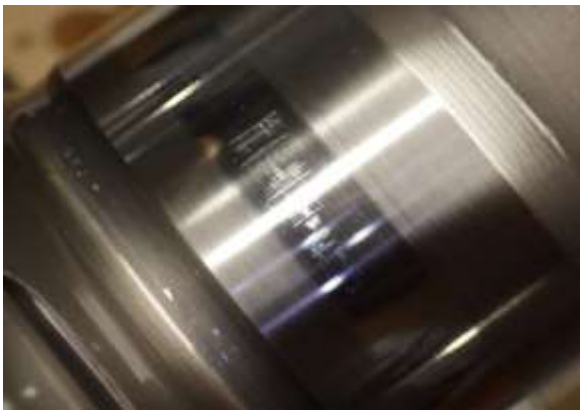
Observations:

1. As received, power and compressor rotors were free to rotate.
2. Damage was observed to the Accessory Gear Box (AGB) fuel pump pad and Gas Generator (GG) case.

Buckling found at the GG case.

The AGB fuel pump pad was found with broken studs. Engine teared down.

<u>Engine Teared Down:</u>



Scores were observed on the 2nd stage carrier at #5 bearing journal.

Light wear was observed at the 2nd stage planet gears teeth

Rubbing at the 1st and 2nd stage PT blades and discs.

Rubbing at the 1st and 2nd stage PT blades and vanes

Rubbing observed at the CT blades tip. The inner and outer liner exhibited normal wear.

1st stage compressor rotor found with light FOD.

4th stage compressor rotor was found in normal condition (previous cut-back observed) The compressor stator were found with normal wear.

Light rubbing at the rear compressor stub shaft

Discussion:

Damage observed to the GG case and AGB housing were because of the sudden stoppage. Light rubbing at the PT blades tip, CT blades tip and compressor were also because of the sudden stoppage.

1.16.3 Stick Pusher Computer:

The involved stick pusher computer was transported to P&W facility for defect investigation. Following observations were made during investigation.

Observations:

Acceptance Test Procedure of stick pusher computer was carried out. A total of 25 test steps were successfully completed. No errors were detected during test.

The Test equipment Stick Pusher was used to run a full Factory Acceptance Test

Discussion:

Since the Stick Pusher Warning Generator (SPWG) showed correct functions and no error at all, it can be assumed that it performed correctly in the aircraft as well.

Based on analysis carried out by Pilatus it can therefore be stated that during the accident flight the left main gear weight on wheel (WOW) switch did not correctly switch to "Air" and therefore the Air/Ground-warning and the Pusher-Caution, with acoustic Master Caution were activated 10 seconds after takeoff and remained "ON". This inhibited the Pusher-function of the SPWG during further flight, however the Shaker-function was still working correctly.

Assuming that the first touchdown upon landing would have activated the left WOW-switch, there is still a 5 second time delay until the Pusher becomes active, making it highly unlikely that the Pusher was ever activated on the accident flight as on ground, both Shaker- and Pusher-functions are inhibited.

1.17 Organizational and management information:

M/s Deccan Charter Pvt Ltd., is a non - scheduled operator with a total of 09 aircrafts ie. 04 fixed wing aircraft and 05 helicopters. The company is in operation since the year 1997. The Company is headed by CEO assisted by various departments. The company holds a valid Air Operator Permit and the Operations manual is approved by DGCA. The company has its own maintenance organisation and it is also approved by DGCA to extend its services for maintenance to other organisations under CAR 145.

The organisation does not has its own training facility for the pilots due which all training of flight crew is conducted at DGCA approved facilities either in India or abroad and is based on the training syllabi approved by DGCA.

As per the M/s. Deccan Charters approved operations manual, in case of command upgrades of co-pilot for single engine turbine airplane below 5700kg the qualification and experience required are follows:

S.no	Flying Experience	Hours required
1	Total flying experience	1000 Hours
2	Total PIC flying experience	300 Hours
3	Total Instrument flying experience as PIC	100 Hours
4	Total PIC flying experience on Type	50 Hours
5	PIC flying experience on type in the last 6 month	10 Hours
6	Total flying experience on type at Night	10 Hours

These requirements are in compliance with CAR Section 3 Series C Part III. The crew are rostered to operate flight in compliance with their operations manual requirements.

1.18 Additional information:

After take off the AIR/GND red warning came ON CAWS and warning remained ON throughout the flight. The involved system is discussed below.

AIR/GROUND SYSTEM:

The airplane is equipped with independent weight on wheel detectors, one on each main landing gear. Each weight on wheel signal is generated by a proximity switch. Each proximity switch controls a relay that provides the AIR/GND signal to the different systems.

The LH weight on wheel signal is sent to the following systems:

a) LH Stick Pusher Computer
b) Cabin Pressurization Control System
c) Central Advisory and Warning System
d) Engine Instrument System
e) Hydraulic System Control

The RH weight on wheel signal is sent to the following systems:

a) RH Stick Pusher Computer
b) Landing Gear Indication
c) Attitude and Heading Reference System
d) Transponder

If a disparity occurs between the detector signals (proximity switch or relay), a failure signal is routed to the Caution And Warning System (CAWS) to activate the warning AIR/GND annunciator after a delay of a maximum of 10 seconds. A voice callout "Warning Air Ground" will also be heard. If both weight on wheel detectors become inoperative at the same time (within a short period of time, maximum 10 seconds), the AIR/GND warning will not be activated.

Failure of a weight on wheel signal, while the **airplane is on the ground** (AIR signal provided), will have the following effects on the systems:

LH and RH Stick Pusher Computers: Stick Shaker and aural stall warning may activate.

Cabin Pressurization: The system will pressurize the cabin to the altitude set on the controller.

Transponder: Transponder may be active.

Landing Gear Indication: Selector Handle Solenoid will be retracted and it will be possible to move the Selector Handle to the UP position and retract the landing gear.

Failure of a weight on wheel signal, while the **airplane is in the air** (GND signal provided), will have the following effects on the systems:

LH and RH Stick Pusher Computers: Stick Pusher is inoperative. Stick Shaker and aural stall warning still operative from the other computer.

Cabin Pressurization: No effect on system operation as long as condition

	lever is not set to GROUND IDLE.
Hydraulic System Control:	No effect on system operation as long as engine is running. If the engine stops, the hydraulic pump will be inoperative due to NON ESSENTIAL BUS shedding and the loss of the AIR/GROUND engine out sensor bypass. The landing gear must be extended in accordance with the Emergency Extension Procedures.
Landing Gear Indication:	Selector Handle Solenoid will go to the locked position preventing gear retraction. Landing gear may still be extended by normal operation.
Transponder:	Transponder will not be working

Failure of Weight on Wheels will have the following effects on the Air/ Ground systems

Central advisory and Caution:	The following warnings and cautions will come on: CAB PRESS, PROP LOW P, STAB TRIM, and HYDR. A subsequent failure of one of these systems will not be annunciated.
Engine Instrument System:	The propeller rpm indication will be correct but the associated warnings and cautions will be erroneous.

AIR GND CAWS WARNING (RED)

IN THE AIR-the following systems could be affected

1. Landing gear	Cycle DN, UP (once only)
If no affect:	
Stick Pusher	Inoperative
Landing Gear Handle	Goes to locked, Possible to lower gear
Solenoid	but not to raise it.

Transponder	Not Operative
Hydraulic Pump	Not operative with engine off
ECS	If Ground Idle selected, cabin would depressurise
Prop Deice	Not operative with engine off

In the accident flight, after the warning came on CAWS, both the crew had carried out the above checklist after takeoff and all systems were normal, but the AIR/GD warning light remained ON. The crew decided to continue the flight to Guwahati.

1.19 Useful or effective investigation techniques: NIL

2. ANALYSIS

2.1 Serviceability of the aircraft

The aircraft VT-DAR was registered with DGCA under the ownership of M/s Deccan Aviation Limited. At the time of accident the Certificate of Airworthiness was current and was valid upto 24/6/2015. The M/s Deccan Aviation was holding a valid Air Operator's Permit No. 02/2001 at the time of accident. As on 28th November 2014 the aircraft had logged 7585:00 airframe hours. The last major 100 Hrs inspection was carried out at 7539:00 Hrs on 18.09.2014. Subsequently all lower inspections, after last flight inspection and pre-flight checks, were carried out as and when due before the accident. The weight and balance of the aircraft was well within the operating limits.

Prior to the accident flight, the aircraft had operated a flight on the previous day and no snag was reported by the pilot. As per the records available there was no pending defect recorded on the aircraft prior to the accident flight.

All the concerned Airworthiness Directive, Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engine has been complied with as on date of the accident. Scrutiny of the snag register revealed that there was no snag pending on the aircraft prior to the accident flight. During Examination of the wreckage, the control

cables for elevator and rudder were checked for full and free movement and were found satisfactory. Both the pilots had mentioned that the engine was running and delivering full power at the time of accident and the damages were due to the result of the aircraft impacting on runway surface.

In view of the above, it is inferred that the serviceability of the aircraft is not a factor to the accident.

2.2 Weather

The weather at the time of landing at time 13:21 UTC at Lokapriya Gopinath Bordoloi International Airport, Guwahati was reported to be winds calm, temperature 21 degrees and visibility 3500 meters. There was no unusual weather phenomenon reported by ATC prior to accident. As per both the pilot statement, the weather was fine with visibility within their landing Minima and no unusual weather was encountered during the flight.

In view of the above, it is inferred that weather was not a contributory factor to the accident.

2.3 Pilot handling of the aircraft

The aircraft took off from Delhi at time 10:18 UTC. During climb out to FL 110, the AIR/GD warning light came "ON" on Caution and Warning System (CAWS) panel along with Master Caution Red. The crew carried out actions as given in the aircraft flight manual, however the Red AIR/GD warning light remained ON along with amber PUSHER warning light. Both the crew discussed and decided to continue with the flight and associated systems were monitored during enroute flight.

The enroute flight was uneventful and while approaching Guwahati, the ATC radar vectored the aircraft for ILS runway 02. The ATS controller cleared VT-DAR to descent to 3500 Ft and heading 060 to intercept the localizer for ILS runway 02. At 03 Nm to touch down the crew configured the aircraft for landing with landing gear down intercepting the glideslope for landing. The crew maintained airspeed of about 95-100

KIAS during final approach which was well within the required approach limits. The autopilot was disconnected at decision height (DH) 350 Feet. The co-pilot who was more experienced on type cautioned the pilot that the flare was inadequate and he should flare more. However the PIC maintained the same attitude of flare out.

As the aircraft was flared close to the runway with very less flare angle, the aircraft landed on its main landing gears and bounced back in air. However by this time the aircraft again bounced for the second time after touch down. At this stage the first officer who was more experienced on type asked PIC to take over controls which was denied by PIC. After the second bounce the aircraft pitch continued to increase at low height, the PIC possibly lowered the aircraft attitude to control pitch and attempted to land the aircraft and in the process the aircraft landed on its nose landing gear.

The nose gear sheared off from its attachment after impact with runway and the propellers came in contact with the runway surface. Subsequently the aircraft skidded on the runway on its nose and came to halt just after the intersection of taxiway E to the runway. Both the pilots and the passenger evacuated the aircraft safely. There was no fire.

2.4 Circumstances leading to the Accident:

After the autopilot was disconnected at decision height (DH) 350 Feet AGL, the co-pilot cautioned the pilot that the flare was inadequate and he should flare more. As the flare was insufficient the aircraft bounced during landing. There was no attempt made by the PIC to control the aircraft after the bounce and in the process aircraft bounced again at a higher pitch. The PIC did not handover the controls to more experienced pilot to handle the situation after the second bounce even though the co-pilot had asked for it. After the second bounce the aircraft pitch was even higher, the PIC tried to lower the pitch attitude of the aircraft and in the process the aircraft landed on the nose gear. The nose gear sheared off from its attachment after the impact and this eventually resulted in the accident.

3 CONCLUSIONS

3.1 Findings

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

b) The certificate of flight release was valid on the day of accident.

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

d) Both the pilots were in the regular employment of the organisation.

e) The PIC total experience on type was only 179 hours including 61:15 Hrs as PIC. However, the Co-pilot total experience on type was 2723 hours including 1720 Hrs as PIC on the type.

f) Both the pilots were duly qualified on type as per Civil Aviation requirements to operate the flight. However, on the subject accident flight the crew combination scheduled to operate the flight reflected more qualified pilot as co-pilot.

g) The PIC was flying as P1 with the more experienced first officer for the first time and were being rostered for this combination or the first time together.

h) After departure from Delhi, during the climb out, the AIR/GD Red warning light came "ON" on Caution and Warning System (CAWS) panel along with Master Caution Red. The crew carried out actions as given in the aircraft flight manual, however the Red AIR/GD warning light remained ON along with amber PUSHER warning light. Both the crew discussed and decided to continue with the flight.

i) During final approach the co-pilot who was more experienced on type caution the PIC that the flare pitch was low.

j) The aircraft made a touchdown with main landing gear and bounced with increasing pitch attitude.

k) The co-pilot asked PIC for the controls after the second bounce which was denied by the PIC.

l) After the second bounce the aircraft pitch continued to increase, the PIC possibly lowered the aircraft attitude to control pitch and in the process the aircraft landed on its nose landing gear.

m) The nose wheel sheared off from its attachment due to the impact and the propellers came in contact with the runway. Thereafter the aircraft skidded on the runway.

n) Both the pilot and the passenger evacuated the aircraft safely.

o) The ATC had activated the fire service after observing sparks and smoke on the runway.

p) The fire personnel sprayed the foam around the engine area to counter for the inadvertent fire.

q) Weather at the time of landing was fine and is not a contributory factor to the accident.

3.2 Probable cause of the accident:

After landing the aircraft bounced twice and the aircraft pitch was fairly high at a low height. The PIC possibly lowered the attitude of the aircraft and in the process the aircraft landed on its nose landing gear which eventually resulted into accident.

4 SAFETY RECOMMENDATIONS:

a) Inexperienced crew, those with less than 100 hrs PIC on type, should be released after a Line Route Check after completion of Supervised Line Flying (SLF) which has to be specified in the Operators Training Manual.

b) DGCA may issue Circular highlighting that Continuation of flight with any RED warning light illuminated on the CAWS panel should be discouraged in the interest of safety.

9/3/16

(A X Joseph)
Deputy Director AAIB
Chairman,
Committee of Inquiry VT-DAR

(Capt. Kishore Chinta)
Operations Member
Committee of Inquiry VT-DAR

Date: 09/03/16
Place: New Delhi