

**FINAL INVESTIGATION REPORT ON SERIOUS INCIDENT TO M/S
RAN AIR SERVICES LTD. PREMIER-1 AIRCRAFT VT-RAL AT
UDAIPUR ON 19.03.2008**

Aircraft		
	Type	Premier I
	Model	390
	Nationality	Indian
	Registration	VT-RAL
2	Owner	M/s. Ran Air Services Ltd., 6-Nehru Place, New Delhi-110019
3	Operator	M/s. Ran Air Services Ltd., 6-Nehru Place, New Delhi-110019
4	Pilot – in –Command	
	CPL No.	3600
	Extent of injuries	Nil
	Age	Approx 29 yrs
5	Co pilot	
	CPL No	2490
	Extent of injuries	Minor
	Age	39 Years
5	No. of Passengers on board	05
	Extent of Injuries	Nil
6	Last point of Departure	Jodhpur
7	Intended landing place	Udaipur
8	Place of Incident	Udaipur 243703.2N, 0735340.0E
9	Date & Time of Accident	19.03.2008, 1007 UTC

SYNOPSIS:

Premier 1 aircraft VT-RAL, owned and operated by M/s Ran Air Services Ltd. was operating Non-Scheduled flight from Jodhpur to Udaipur on 19.03.2008. There were five passengers and two crewmembers on board the aircraft. The aircraft took off normally from Jodhpur. The weather throughout the cruise was turbulent. The pilot planned for visual approach at

Udaipur. During approach on selection of flaps he experienced the flap was not responding and got the message “Flaps-Failed”. Subsequently the pilot carried out the check list for flap-less landing. However the pilot approached with a higher speed and impacted heavily on the runway from 25 feet approx. Consequently both the main wheel tyre got burst and the aircraft veered to the right, went out of the runway and stopped after impact with the airport boundary wall. The aircraft received damages and all the occupants escaped unhurt except the co-pilot, who received minor injuries. There was no fire.

1. FACTUAL INFORMATION:

1.1 History of Flight:

The Aircraft VT-RAL operated flight Delhi-Jodhpur on 18.3.2008 under the command of appropriately licenced crew in possession with the CPL No. 3600 and a copilot having CPL No. 2490. There was no snag recorded/experienced by the crew during the flight.

On 19.3.08 the approved DI inspection schedule was carried at Jodhpur before operating the flight to Udaipur by the AME who was in possession with a valid Transit Inspection Approval. There was no abnormality observed during the inspection and cleared the aircraft for the flight.

The aircraft, after necessary met and ATC briefing took off at 0940 UTC from Jodhpur on direct route W58 at cruise FL 100 and sector EET 20 minutes as per Flight Plan. No abnormality was reported / recorded by the pilot during take off from Jodhpur. The crewmember of the aircraft while operating Jodhpur–Udaipur were the same who operated flight Delhi-Jodhpur on 18.3.2008. There were five passengers also on board the aircraft. The aircraft climbed to the assigned level where the pilot was experiencing continuous turbulence at FL100. The pilot communicated the same to the ATC Jodhpur and requested for higher level which was not granted and advised to continue at same level and contact ATC Udaipur for level change. It came in contact with Udaipur at 0944 UTC, approx 50 NM from Udaipur. At 0948 the weather passed by ATC was winds 180/07 kts. Vis 6 km. Temp 34, QNH 1006 Hpa and advised for ILS approach on Rwy 26. Consequently the pilot requested to make right base Rwy 26 visual approach, which was approved by the ATC. Aircraft did not report any defect/snag. Pilot further stated that during approach to land at Udaipur when flap 10 degree was selected, the flap didn't respond and 'Flaps-Fail' message flashed. Thereafter he carried out the check list for flap-less landing. At 1004 UTC

when the aircraft reported on final the ATC cleared the aircraft to land on RWY 26 with prevailing wind 230/10 Kts. The same was acknowledged by the crew and initiated landing. At about 20 to 30 feet above ground the pilot stated to have experienced sudden down-draft thereby the aircraft touched down heavily on the runway. The touch-down was on the centerline, at just before the Touch down Zone (TDZ), on the paved runway, after the threshold point. Consequent to the heavy impact both the main wheel tyre got burst; first to burst was right tyre. The aircraft rolled on the runway center line for a length of about 1000 feet in the same condition. Thereafter it gradually veered to the right of the RWY26 at distance of approx 2200 feet runway length from the thresh-hold of the runway. The aircraft left the runway shoulder and after rolling almost straight for another 90 ft it stopped after impact with the airport boundary wall.

Airport fire services immediately reached the site and rescued all persons on board. Except the co-pilot, who received minor injuries all other occupants escaped unhurt. The aircraft received damages. There was no evidence of pre/post impact fire.

1.2. Injuries to Persons:

Injuries	Crew	Passengers	Others
Fatal	Nil	Nil	Nil
Serious	Nil	Nil	Nil
Minor/None	02	05	

1.3. Damage to Aircraft: The details of the damage are appended below:

- (a) Radome got badly damaged due impact.
- (b) Left Forward baggage door warped due to impact and stuck open.
- (c) Right avionics compartment got damaged.
- (d) Right wing tip sheared off.
- (e) Right aileron damaged.
- (f) Left flap inboard damaged.
- (g) Left spoiler (lift dump) attachment buckled.
- (h) Left wing tip damaged.
- (i) Left wing bottom damaged.
- (j) The entire three undercarriages damaged and bent.

- (k) Wing attachment bolt forward spigot fitting nut missing, attachment dislocated.
- (l) Fuel tank both side inboard portion got damaged.
- (m) Belly damaged particularly inboard portion.

The fuel was found dripping continuously from the aircraft belly area after the crash. However, about 70 liters of fuel was recovered from the wing tanks after the day of the incident.

1.4. Other Damages: Nil

1.5. Personnel Information:

1.5.1 Pilot – in –Command

Age:	30 yrs Approx
Licence:	CPL 3600
Date of Issue:	01.01.1999
Valid up to:	22.01.2013
Category:	Aero plane
Class:	Single/Multi Engine, Land
Endorsements as PIC:	<ul style="list-style-type: none"> i. Cessna 152 ii. Cessna 172 iii. CH 2000 iv. PA 34 v. Premier 1
Date of last Med. Exam:	May 2007
Med. Exam valid up to:	May 2008
FRTTO Licence No:	7382
Date of issue:	01.01.1999
Valid up to:	22.01.2013
Total flying experience:	2900:00 Hrs
Experience on type:	40:00 Hrs
Total flying experience during last 90 days:	90:00 Hrs
Total flying experience during last 30 days:	40:00 Hrs
Total flying experience during last 07 Days:	14:00 Hrs

Total flying experience during last 24 Hours: 03:00 Hrs

He had endorsement on his licence the Piper Seneca, CRJ 200, B737 (NG) and Premier 1 (Jet) also.

1.5.2 CO- Pilot

Age:	39 yrs Approx
Licence:	CPL 2490
Date of Issue:	25.07.06
Valid up to:	18.08.2010
Category:	Aero plane
Class:	Single/Multi Engine, Land
Endorsements as PIC:	<ul style="list-style-type: none">i. Cessna 152ii. Puspak Mk Iiii. King Air C90iv. Super King Air B200v. Premier 1
Date of last Med. Exam:	July 2007
Med. Exam valid up to:	July 2008
FRTO Licence No:	4474
Date of issue:	31.01.1992
Valid up to:	07.08.2010
Total flying experience:	896:20 Hrs
Experience on type:	58:15 Hrs
Total flying experience during last 90 days:	63:00 Hrs
Total flying experience during last 30 days:	46:30 Hrs
Total flying experience during last 07 Days:	07:20 Hrs
Total flying experience during last 24 Hours:	02:30 Hrs

1.6. Aircraft Information:

Premier I Model 390 VT-RAL aircraft was manufactured by M/s Raytheon Aircraft Company, Wichita, USA in 2001. Premier I Model 390 aircraft bearing serial number RB-23 has been duly registered in

the register of India with effect from 30.10.2006 and allotted with registration certificate No. 3446.

The model 390 is a metal and carbon fiber composite low wing airplane powered by two FJ 44-2A turbofan engines, each having minimum of 2300 pounds of takeoff thrust, manufactured by Williams/Rolls Inc. One engine is located on each side of the Upper Aft Fuselage. The engines have medium by-pass ratio and mixed exhaust. There is no thrust reversal mechanism on the engines. The fuselage is of carbon fiber /reinforced epoxy (CFRE) honeycomb mono-coque construction. Aluminum alloy is used for wing and other selected structure. Composite structure consists of graphite plies and honeycomb core is used for the vertical stabilizer skin and horizontal stabilizer structure (The horizontal stabilizer is located on top of the vertical stabilizer). A circular cabin section is utilized with a dropped aisle in the passenger cabin to provide additional head room. The cabin is pressurized. The airplane is equipped with retractable tricycle landing gear with air / oil shock struts. The nose landing gear retracts forward into the fuselage. Each main wheel has anti-skid equipped brakes with independent systems and hydraulic back-up. Dual mechanical controls with three axis electrical trim operate the ailerons, rudder & elevator. The spoilers are electronically controlled and hydraulically operated, providing a speed brake / lift dump /roll control capability. Single slotted Fowler Flaps are electrically controlled and driven. The Flap panels are electrically controlled (by the Flap Control Unit and one Actuator for each flap), monitored and actuated in a closed loop positioning system. Each engine drives a hydraulic pump which provides 3000 psi to operate landing gear, spoiler system, and anti-skid / power brakes. Electrical system includes two 28.5 V DC, 325 Amps Starter /Generators, one battery and an emergency power source.

Nose wheel steering is mechanically linked with rudder deflection, controlled through rudder pedals. Rudder pedal mechanical linkage steering angle is 25 deg left or right. Differential brakes and asymmetric thrust can steer the nose wheel by an additional 20 degrees.

Anti Skid System:

The Airplane is equipped with electrically controlled anti-skid system, incorporated in the Power Brake System, operated by toe action on the rudder pedals. The Power Brake / Anti Skid Control Valve applied hydraulic pressure to the brakes relative to the Pressure applied by the Brake Pedals.

Emergency braking is accomplished through the parking brake system (with Hydraulic Accumulator), by means of the Parking Brake Lever. The Anti-skid system detects the start of a skid condition at the wheels and automatically releases the brake pressure for both wheels in proportion to the severity of the skid. The system also provides touch-down and locked wheel protection. Touchdown protection inhibits braking until 03 seconds after detection of weight on any one of the main landing gear wheels (by means of squat switches). Locked wheel protection initiates a full brake release if either wheel slows to 30% or less of the other wheels velocity at any speed above 25 knots. A wheel speed transducer is mounted inside each main landing gear axle, detects any change in wheel rotation speed. The Anti Skid Control Unit (ACU) monitors inputs from the wheel transducers for evidence of wheel skidding. The system is activated by placing the Anti Skid Switch in the 'Norm' position (Not 'Off'). However, there is a caution for the Pilot: Do not land with the brake pedals depressed.

Speed Brake / Lift Dump System:

The outboard and middle spoilers are used as Speed Brake as well as for Roll Control when airborne and along with inboard spoilers, for lift dump on ground. The operation is controlled by means of Speed Brake Switch located on the central pedestal. The SCU (Spoiler Control Unit) determines the function depending on WOW (Weight on Wheels) input.

Flap System:

An electronic monitor in the FCU provides continuous malfunction monitoring. The position sensors on each actuator protect against asymmetry. In the event of a malfunction the monitor system automatically inhibits the control electronics and drive motors to prevent further flap deployment. When this occurs, FLAP FAIL annunciator illuminates.

Total aircraft and engines hours done were 989:09 hrs/812 cycles TSN/CSN as on 18.03.2008 before the subject incident. There were no snags reported prior to the incident flight.

DGCA Certificate of Registration No.3446 CAT 'A' issued on 30.10.2006. Certificate of Airworthiness (C of A) No.2855 issued on 30.10.2006, validated till 02.09.2011. DGCA aircraft Noise Certificate No.2855 (NC) issued on 01.01.2006. DGCA Non-Scheduled Operators Permit issued on 16.01.2006.

Log books transferred from original tech log book of US registration for the aircraft N488R.C. The first entry in log book of VT-RAL was on 12.10.2006 at 783.40 Airframe hrs. /625 cycles TSN /CSN.

Last Minor Inspection Schedule of 50 hrs / 1 month was carried out for airframe and both engines (LH S/N 1039 & RH S/N 1048) and Radio at 963:25 HRS /789 CYCLES TSN / CSN on 27.02.2008, by the approved Maintenance Organization M/s Shaurya Aeronautics (P) Ltd., New Delhi and CRS (Certificate of Release to Service) was issued thereafter. Last major inspection schedule was C of A renewal which was carried out on 27.08.07 at 875:35 airframe hrs/693 landings TSN/CSN, after related work schedule and weighing schedule done at M/s Hawker Pacific Asia PTE Ltd., Singapore, on 17.08.07. The C of A test flight report was satisfactory. During the C of A renewal work the Nose Wheel Bearing was replaced.

Both the Main Wheel Brakes (P/N 3-1576) were subsequently replaced with new during 50 hrs./ 1 month inspection schedule on 30.09.2007 and the aircraft thereafter has done 100 landings prior to the incident flight.

The Approved Weight Schedule of the aircraft, which was valid till 15.08.2012 revealed that

the aircraft Empty Weight of:-	3833.33 kgs. (8448.65 lbs.)
Maximum Take-off Weight :	5670 kgs. (12,500 lbs).
Maximum landing weight:	5272.73 kgs (11,600 lbs)
The CG position of Empty Weight:	307.49 inches aft of datum
range for CG movement:	294.4 to 300.20 inches aft of datum for AUW 12,500 lbs.

The load and the trim sheet of the incident flight was prepared; scrutiny of which revealed that the pay load of the aircraft during the flight was calculated to be 12072 lbs against maximum take off weight of 12500 lbs. the load of the aircraft was within specified limit and the C.G was within the range..

The last Daily Inspection Schedule was carried out on 19.03.2008 along with the Pilot acceptance certificate, before the first flight of the day.

1.7. Meteorological Information:

Met report at Udaipur Airport is available at ½ hour intervals. The Met Report received on 19.03.08 revealed that

- At 0900 UTC: winds 200 deg / 08 kts, vis. 06 kms. SKC, Temp. 34 deg.C, DP 7 deg, QNH 1006 & QFE 947 hPa.
- At 0930 UTC: winds 180 deg / 07 kts. Vis 06 kms. SKC, Temp.34 deg.C, DP 7 deg, QNH 1006 & QFE 946 hPa.
- At 1000 UTC was winds 230 deg / 10 kts, vis. 06 kms. Temp. 35deg.C, DP 7 deg, QNH 1006 & QFE 946 hPa.

1.8. Aids to Navigation:

Udaipur Airport is equipped with all the latest navigational aids such as DME, DVOR, ILS RWY 26, PAPI RWY 08/26 etc. All the equipments were maintained operational on the day of the incident.

The aircraft was adequately equipped and duly approved by ATC Udaipur to approach to land under VFR in VMC during day.

1.9. Communication:

The recording on ATC tape was maintained operational at Udaipur Airport. ATC Tape Transcript of VHF 122.3 MHz. of Udaipur Tower VHF revealed:

- At 0948 UTC, VT-RAL first contacted Udaipur and was given clearance via W58 for ILS approach RWY 26. Udaipur weather given was Winds 180/ 07 knots, Visibility 06 kms, sky clear, QNH1006 hPa.

- At 0954 UTC, VT-RAL reported position 35 DME from Udaipur. VT-RAL was given descent clearance to 5500 feet for Arc-ILS approach RWY 26.
- At 0955 UTC, VT-RAL requested for making Right Base 26 Visual Approach and was approved by Udaipur.
- At 0958 VT-RAL was at 05 DME 5500 feet and requested further descent and stated that runway was in sight.
- At 0958 UTC, VT-RAL was cleared for visual approach RWY 26 and asked by ATC to report Right down Wind RWY 26.
- At 0958 UTC, ATC cleared VT-RAL to circuit altitude at 3200 feet.
- AT 0959 UTC VT-RAL reported position at 10 DME.
- At 0959 UTC, VT-RAL was asked to reduce speed; Kingfisher ATR was lining up RWY 26. VT-RAL replied Wilco Alpha Lima, Joining right Down Wind.
- At 1001 UTC, VT-RAL was asked to report finals Long Finals RWY26, to which VT-RAL acknowledged.
- At 1002 UTC, VT-RAL replied Turning Right Base.
- AT 1003 UTC, ATC affirmed VT-RAL to descent as per profile.
- At 1004 UTC, VT-RAL was cleared to land RWY 26, wind 230/10 knots and VT-RAL acknowledged the same.
- At 1007 UTC, KFR 2332 called ATC that some ELT activated on 121.5 MHz. ATC kept calling VT-RAL but there was no response.
- At 1008 UTC, ATC informed Fire Station on Walkie-Talkie of VT-RAL at the beginning of RWY 26.
- AT 1010 UTC, Fire Station replied that rescue was successfully carried out. Only one Pilot reported injured. No Fire. No other damages.

1.10. Aerodrome Information:

Udaipur airport is controlled and maintained by Airport Authority of India. The airport is located at 243703.2N, 0735340.0E with 1684 feet of elevation from AMSL. The direction of the runway is 08 /26, used depending on the wind direction. The dimension of the runway is 2281X45M. Runway is Tar/Asphalt and slope is negligible. The runway condition during the incident was 'Dry'.

The aircraft VT-RAL was cleared for visual approach to land at Rwy 26.

1.11. Flight Recorders:

Premier I Model 390 VT-RAL aircraft was installed with SSCVR type Fairchild P/N 2100. The CVR was replayed wherein the Captain (PF), was also associated to identify the voices. The abrupt stoppage of the CVR recording was probably due to activation of the impact Switch which is meant for cut-out the CVR upon an impact. The landing Gear was extended during final Approach, after receiving landing clearance from ATC Udaipur. Just before “1000” feet Radio Altitude, on selection of the Flaps to Flaps-10, “Flap Failed” message was reported by the PNF (Pilot Not Flying / Co-Pilot). Thereafter the PF (Pilot Flying) called to set the speed bugs to 135 knots, to which the PNF replied that speed was not holding below 149 knots. There was “GLIDE SLOPE” GPWS Warning twice and then “500” feet Radio Altimeter voice alert and ‘MINIMUMS’ voice alert and immediately there was a long ‘Beep’ tone heard. Thereafter there was no further conversation heard and the only unusual loud noise heard was the possible touch-down and immediately the CVR recording stopped.

1.12. Wreckage and Impact Information:

Heavy rubber deposits were observed for a length of about 150 feet indicative of heavy braking on both the wheels. The main wheel span was of 03 meter approx. the rubber deposits were continuous and steady (viz. decreasing gradually from the first point of application of the brakes), with periodic high and low intensity of rubber deposit and also widening & narrowing of the width of the tyre brake marks of each wheel, which is indicative of Anti-skid system was possibly effective which had cyclically released the wheels from getting locked due to heavy braking. The aircraft landed on the runway centerline and thereafter kept rolling along the centerline even after bursting of both the tyres.

There is an indication that the aircraft might have bounced slightly after the first touch-down (missing tyre rubber deposit / brake mark for about 10-12 feet). Subsequently light wobbling marks (continuous lateral striations at about 03-04 inches intervals) were observed on the rubber deposits of the tyre brake marks. These wobbling marks indicate possibility of both the tyres burst after landing.

It appeared that the right tire had burst first thereby the aircraft in motion and the nose wheel got slanted. There was about 05 feet distance of Nose Wheel Tire dragging marks on the runway, starting at about 30 feet after the beginning of the main wheel tire marks (which may be considered as the aircraft touch-down point). Thereafter the left wheel tire also had burst. There was marks of right hand main wheel hub scratching marks on the runway (in the longitudinal direction of motion) for about 100 feet distance. The left main wheel also had hub scratching marks on the runway. The aircraft continued to slide /scrap on the runway. Thereafter possibly the right wing went down and the right wing tip scrapped the runway surface. After the 1000 feet mark after the Touch Down Zone, the aircraft gradually swung out of the runway after hitting at the side of one of the runway edge light (Light No.25, from the thresh-hold of RWY 26, which is located at a runway distance of 750 meters; since the distance between consecutive lights is 30 meters).

The Aluminum shinning mark of both the main wheel hubs was observed on the runway surface at 240 feet from the thresh-hold of R/W 26. Possibly the left tire came out at approx 400 feet from the runway thresh-hold and the left wheel kept rolling without the tire thereafter.

The aircraft in this condition with no tire on the left wheel and burst tire on the right wheel continued to roll on the runway center line for a length of about 1000 feet. Thereafter the aircraft gradually veered to the right of the RWY26 at distance of approx 2200 feet runway length from the thresh-hold of the RWY 26. The aircraft left the runway shoulder and entered the 'kucha' and after rolling almost straight for another 90 feet, stopped with impact with the airport boundary wall.

The impact was lessened due to the presence of an open drain (dry) located just inside the perimeter wall of the airport, in which the aircraft forward section ditched and the aircraft stopped with the right side of the nose section colliding with the wall. There was no damage to the boundary wall.

The airport fire services immediately reached the site and rescued the passengers. There was no fire. The Co-pilot received minor injuries due to impact. There were no other injuries. The aircraft stopped at Magnetic Compass Heading indicating 330 degrees.

The cockpit of the aircraft indicated that the Flap Lever setting was at UP position. The Lift Dump lever was at retracted condition. The Anti-skid switch position was 'Norm' (Active). The engines were cut off. The parking brake lever position indicated brakes not engaged (Lever not pulled). On the aircraft, the horizontal stabilizer surface position was set at Leading Edge Up above the neutral line mark. The Flaps and the Lift Dump devices control surfaces were all in retracted condition (stowed).

Both the main tires were found burst from base and sidewalls having partial "x" shaped tear marks and indications of erosion due to braking action. Some burning signs were also observed on the plies. One of the main tires had substantial rubbing marks and mud deposits on one sidewall. A few pieces of tire plies were also recovered from the runway. The nose tire was found burst having "x" shaped tear on the sidewall, however there was no significant rubbing marks.

The following aircraft components were recovered (found confined to the area of impact:-

Beacon light, VHF II antenna, under carriage door main-inboard, under carriage door main outboard. Belly panel near tank drain point, Ventron, Both static dischargers, Complete belly skin, Nose wheel door and up-lock roller, Nose wheel axle, Fuel drain panel, Both main wheel tires, Under carriage door (nose)-1 & 2, Nose wheel wing collar, RH wing tip (found having uniform grazing marks with surface).

1.13. Medical and Pathological Information:

N/A

1.14. Fire:

There was no fire.

1.15. Survival Aspects:

The accident was survivable. All the persons on board were rescued with the assistance of the airport fire services immediately. The Co-pilot received minor injuries due to impact. There was no injury to any other passengers or crew.

1.16. Test and Research:

N/A

1.17. Organizational and Management Information

The aircraft was owned and operated by M/s. Ran Air Services Ltd., 6-Nehru Place, New Delhi-110019. They had valid Non Schedule Operating Permit to operate Premier 1 aircraft VT-RAL.

1.18. Additional Information:

As per the FAA approved Flight Manual of Hawker Beech craft Corporation for Aircraft Premier 1 Model 390:

The corresponding Average Landing Distance is 3350-3400 feet, or 3375 feet approx., and V ref 114 knots. There is a Landing Distance correction of 140 feet for 10 knots headwind. The Associated conditions are: as required to maintain 3 deg approach angle to 50 feet & retard to Idle at 50 feet; approach speed : V ref; Flaps: Down; Anti-skid: Normal; Brake: Maximum; Lift Dump: Extended after touch down. There is an increase in landing distance of 60% for Flapless Landing as per the check-list. Therefore the Landing Distance is corrected as $3375-140=3235 + 1941 = 5176$ feet, which is considerably less than the total runway length available for landing corresponding to V ref of 114 knots the Vac is 127 knots, conforming to the weight of 11000 pounds.

The Abnormal Procedures Check List for Flap Failure primarily states necessary roll and ruder trimming – As required to relieve forces and to Land at Nearest Suitable Airport and that the Landing Distance will increase by about 60% for Flaps Up landing.

The main points of the Check list for Flaps Up Approach & landing includes the following tasks in sequence of operation:-

Landing gear – Down; Lift Dump – Unlock, handle illuminated, J lock clear; Flaps – Set for landing; Speed Brakes - Retract; Autopilot - Disengage; Airspeed - (Flaps UP) = V ref + 20 KIAS; Yaw Damper – Off; Thrust - Idle; Brakes (After Touch Down) - APPLY; Pitch Attitude - NOSE WHEEL ON GROUND; Lift Dump – EXTEND.

1.19 Useful or effective Investigation Techniques:

Nil

2. ANALYSIS :

2.1 Serviceability/Maintainability of the Aircraft

Last Minor Inspection Schedule of 50 hrs / 1 month was carried out for airframe and both engines (LH S/N 1039 & RH S/N 1048) and Radio at 963:25 HRS /789 CYCLES TSN / CSN on 27.02.2008, by the approved Maintenance Organization and CRS (Certificate of Release to Service) was issued thereafter. Last major inspection schedule was Certificate of Airworthiness (C of A) renewal, Carried out on 27.08.07 at 875:35 airframe hrs /693 landings TSN / CSN. The C of A test flight report were satisfactory. During the C of A renewal work the Nose Wheel Bearing was replaced. Both the Main Wheel Brakes (P/N 3-1576) were subsequently replaced with new during 50 hrs./ 1 month inspection schedule on 30.09.2007 and the aircraft operated for 100 landings, prior to the incident flight. There was no snag reported/recorded in the aircraft or its system after the last C of A issued. Certificate of Airworthiness No.2855 issued on 30.10.2006, validated till 02.09.2011. The aircraft had approved and valid weight schedule. The aircraft was last weighed on 16.08.2007 and the next weighment was due on 15.08.2012.

The Aircraft operated flight Delhi-Jodhpur sector on a day prior; there was no snag recorded/experienced by the crew during the flight. On the day of the occurrence i.e 19.03.08 the approved DI inspection schedule was carried at Jodhpur before operating the flight to Udaipur by the AME who was in possession with a valid Transit Inspection Approval. There was no abnormality observed during the inspection and cleared the aircraft for the flight. The aircraft was adequately refueled. The load and the trim were within specified limit.

The above deliberations reveal that the aircraft was in possession of valid C of A and no snag/MODs were due. The schedule was carried out before releasing the aircraft for the flight on the day of the incident. Hence it can be concluded that Serviceability/Maintainability of the Aircraft was not the factor of the incident.

2.2 Operational Aspect

The aircraft took-off from Jodhpur at approx 0940 UTC for Udaipur after necessary clearance from ATC on 19.03.08. It was under the command of appropriately licenced and experienced pilot along with a copilot on board. There were five passengers also on board the flight. The aircraft was cleared for W58 and cruising level FL 100 with due FIC & ADC clearance, Jodhpur and Jaipur was filed as alternate. The expected elapsed time was 20 minutes and Endurance 03 hours. The load and trim was calculated with the required fuel and 7 persons on board; which was observed to be within the limit.

The aircraft took off normally and gained the assigned FL 100. The pilot experienced turbulence during cruise. The aircraft was behaving usually normal. The pilot reported all operation normal to Udaipur. The aircraft was cleared for visual approach on Runway 26.

When the aircraft reported on final the ATC cleared to land. The winds during landing were 230 degrees / 10 knots and Temperature 35 degrees Celsius. Udaipur Airport Elevation is 1684 feet (AMSL) and Runway length available is 7500 feet. Runway is tar/asphalt and slope is negligible. The runway condition was 'Dry'. The headwind component (right hand) when resolved on RWY 26 was about 08 knots Headwind approx the sky was clear, visibility 06 kms. It can be concluded that weather was not a factor to the incident.

The aircraft reported finals and extended Landing Gear after receiving landing clearance from ATC Udaipur. Just before 1000 feet Altitude, the pilot selected the Flaps to Flaps-10. The flap didn't respond and 'Flaps-Fail' message flashed. Thereafter the pilot decided to go for a flap-less landing. The pilot carried out the check list for Flaps Up approach & landing and advised the co-pilot to set the speed up to 135 kts. It was experienced that the speed was not coming below 149 kts. The pilot decided to continue landing with the speed higher than assigned speed instead of making a go around. While he was at about 25 feet above the threshold point he impacted the aircraft on the runway. It rolled for a length of about 150 feet with heavy braking on both the wheels causing heavy rubber deposits on the runway. There was a possible bounce after touch down and subsequent both main wheel tire burst due to high brake energy dissipation. The pilot did not extend Lift Dump lever to trim down the speed. In the process tyre got

burst and the aircraft veered to right and hit the boundary wall and damaged the aircraft.

The facts stated by the pilot that while he was at about 20 to 30 feet above ground, he experienced sudden down-draft and the aircraft impacted heavily on the runway at approx at 1007 UTC. The met report issued at 1000 UTC doesn't suggest that there was any possibility developing down-draft; hence the pilot's proclamation in this regard is ruled out. Conversely, it can not be ruled out that the pilot would have operated Lift Dump after it had reached the touch down zone. Thereby losing the lift suddenly and impacting the aircraft on the runway.

In the light of the above discussions it can be concluded that the crew was appropriately licenced and experienced to operate the aircraft, the weather during landing was fair and not the contributory factor to the incident. Pilot's decision to continue landing with the higher speed which was a factor to the incident.

2.3 Circumstances leading to the incident

The take off from Jodhpur, the flight en-route up to approach to land at Udaipur was uneventful. After due clearance to land at Udaipur the pilot selected the Flaps to Flaps-10; the flap didn't respond and 'Flaps-Fail' message flashed. The pilot decided to go for a flap-less landing and carried out the check list for Flaps Up approach & landing. The approach speed of the aircraft was probably high and it could not be brought to the assigned limit for flap less landing. The pilot continued approach at high speed. From about 25 feet height, the aircraft had a sort of free fall and impacted the runway. It rolled for about 150 feet with heavy breaking on both the wheels; which caused heavy rubber deposits on the runway and subsequent tyre burst. The aircraft veered to right and hit the boundary wall before it stopped.

3. CONCLUSION:

3.1 FINDINGS :

- 3.1.1 The aircraft was maintained in airworthy condition.
- 3.1.2 All the MOD's & SB's were complied.

- 3.1.3 There was no snag reported on the aircraft before the incident flight.
- 3.1.4 Daily inspection (DI) of the aircraft was carried out by approved engineer as per approved schedule.
- 3.1.5 The prevailing weather was fine and did not contribute to the incident.
- 3.1.6 The pilots were appropriately licensed and experienced to undertake the flight.
- 3.1.7 During approach when Flap was selected to 10 deg down, 'FLAP FAIL' message appeared. Thereafter the Pilot decided to carry out a Flap-Less Landing and reviewed the abnormal procedures check list for Flap-Less Landing.
- 3.1.8 The approach speed for Flap-Less Landing was about 149 knots against the calculated speed 130-135 knots approx.
- 3.1.9 The pilot continued landing with speed higher than calculated speed instead of executing a go around.
- 3.1.10 The aircraft impacted the runway from about 25 feet height. The pilot did not operate Lift Dump while rolling on the runway.
- 3.1.11 The aircraft probably bounced after touch down.
- 3.1.12 Both the main wheel tire conditions and the periodic intensity of the thickness & width of the rubber deposits on the runway surface were indicative of heavy braking action and the Anti-Skid System functional. Subsequently both main wheel tire burst due to high brake energy dissipation.

3.2 Probable Cause :

Incident occurred as the aircraft impacted runway with higher speed while carrying out flapless approach and landing.

4. RECOMMENDATIONS :

- 4.1 The action as deemed fit may be taken against the Pilot in Command in view of findings 3.1.9 and 3.1.10.
- 4.2 Air Safety Circular may be issued for the information and guidance of all operators highlighting the requirement to adhere the Go-Around procedure.

Dated 23.09.2009

(Sanit Kumar)
Asstt. Director Air Safety
Inquiry Officer, VT-RAL