FINAL INVESTIGATION REPORT ON SERIOUS INCIDENT TO M/s. PAWAN HANS LTD. DAUPHIN SA 365 N HELICOPTER VT-ELR ON 20.11.2013 NEAR CHOWRA ISLAND.

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Deputy Director-AAIB
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Member, Committee of Inquiry - VT-ELR

Foreword

In accordance with Annex 13 to the Convention on International Civil Aviation and Rule 3 of Aircraft (Investigation of Accidents andIncidents), Rules 2012, the sole objective of the investigation of an accident or serious incident shall be the prevention of such occurences and notto apportion blame or liability.

Consequently, the use of this report for any purpose other than for the prevention of future accidents and serious incidents could lead to erroneous interpretations.

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Glossary

A/F	Airframe
ALF	After Last Flight
AME	Aircraft Maintenance Engineer
ATC	Air Traffic Control
BA	Breath Analyser
BFF	Before First Flight
C of A	Certificate of Airworthiness
CB	Circuit Breaker
CG	Centre of Gravity
CVR	Cockpit Voice Recorder
DAW	Director of Airworthiness
DFDR	Digital Flight Data Recorder
DGCA	Directorate General of Civil Aviation
IST	Indian Standard Time
LH	Left Hand side
NM	Nautical Miles
PHL	Pawan Hans Ltd.
PIC	Pilot In Command
P/N	Part Number
QNH	Quasi Non Hydrostatic
RH	Right Hand Side
SLL	Service Life Limit
S/N	Serial Number
UTC	Co-ordinated Universal Time
VFR	Visual Flight Rules

FINAL INVESTIGATION REPORT ON SERIOUS INCIDENT TO M/s.PAWAN HANS LTD. DAUPHIN SA 365 N HELICOPTER VT-ELRON 20.11.2013 NEAR CHOWRA ISLAND.			
1	Aircraft		
		Type	DAUPHIN SA 365 N HELICOPTER
		Nationality	Indian
		Registration	VT-ELR
2	Owner		M/s Pawan Hans Ltd.
3	Operator		M/s Pawan Hans Ltd.
4	Pilot – in –Command		Flying under Rule 160
		Extent of injuries	None.
5	Co Pilot		Flying under Rule 160
		Extent of injuries	None.
6	No. of Passengers on board		05
	Extent of Injuries		None
7	Last point of Departure		Kamorta Helipad.
8	Intended landing place		Car Nicobar Helipad.
9	Place of Incident		About 35 NM from Kamorta Helipad.
10	Date & Time of Incident		20.11.2013, 05:55 UTC
11	Type of Incident		Rear Sliding/flap Door Flown off during flight

All the timings in the report are in UTC

SYNOPSIS

M/s. Pawan Hans Ltd. Dauphin SA 365 N Helicopter VT-ELR was involved in a serious incident while operating scheduled inter-island flight Kamorta - Car Nicobar on 20.11.2013 at 35 NM from Kamorta Helipad. The helicopter was under the command of Pilot in Command flying under the privileges of Rule 160 with co-pilot who was also flying under the privileges of Rule 160.

On 20.11.2013 Helicopter VT-ELR was scheduled to operate inter-island flights on route Port Blair- Car Nicobar- Teressa – Katchal – Kamorta - Car Nicobar - Port Blair**.** The flight crew accepted the helicopter as per the procedure. The helicopter got airborne from Port Blair at 02:45 UTC with 06 passengers on board and reached Car Nicobar at 04:05 UTC. 03 passengers disembarked the helicopter from the starboard side at Car Nicobar. Thereafter refuelling was carried out and the helicopter took-off with other 03 passengers on board. Both pilots reported that they had carried out the external checks, pre-take off checks, the closing and locking of doors prior to operating flight at Car Nicobar.

The helicopter took off from Car Nicobar at 04:15 UTC for Teressa helipad and reached Teressa helipad at about 04:50 UTC. 03 passengers boarded the helicopter from the starboard side out of which one passenger who was seated on the last row near LH sliding door was facing difficulty in putting on the seat belt. The Co-pilot went to the Port Side and opened the LH sliding door and after assisting the passenger he had closed all doors (LH & RH). The helicopter then took-off from Teressa and reached Katchal helipad at 05:10 UTC**.** At Katchal 02 passengers boarded the helicopter from the starboard side and they seated in the last row. The LH side doors were not opened. The helicopter then took off from Katchal with 08 passengers on board. The helicopter reached Kamorta helipad at about 05:25 UTC. At Kamorta 03 passengers were disembarked from the Starboard side. The LH side door was not opened. As there were no passengers boarded from Kamorta, all 03 passengers in the last row were shifted to the front row. There were total of 05 passengers onboard, out of which 03 were seated in the front row and the other 02were seated in the middle row. The helicopter then took off from Kamorta helipad with 05 passengers on board for Car Nicobar.

All the sectors from Port Blair and till Kamorta Helipad were uneventful. However at about 35 nautical miles from Kamorta while flying at 136 Kts both pilots experienced some

vibrations for a few seconds and the pilot immediately reduced the power and also the speed. Soon after a loud bang sound came from the cabin and they observed that the port side rear sliding door and flap door had flown off. The same was also confirmed to the pilots by one of the passenger who was seated in the middle row near LH door.ThePIC decided to divert the helicopter to the closest helipad, Chowra, which was about 6 NM away from the incident point. Accordingly, Car Nicobar ATC was informed and precautionary landing was carried out safely at Chowra helipad at around 06:00 UTC. There was no injury to any person on board the helicopter or any person on ground and there was no fire.

Ministry of Civil Aviation constituted a Committee of Inquiry to investigate the cause of the serious incident vide Order No. AV 15018/32/2013-DG dated 7th January 2014 under Rule 11 (1) of Aircraft (Investigation of Accidents and Incidents) Rules 2012 comprising of Sh. S Durairaj, Assistant Director, AAIB as Chairman and Sh. K. Ramachandran, Air Safety Officer, AAIB as Member.

1. FACTUAL INFORMATION

1.1 History of Flight

On 20.11.2013 M/s. PawanHansLtd. Dauphin SA 365 N Helicopter VT-ELR was operating scheduled inter-island flights on route Port Blair- Car Nicobar-Teressa – Katchal – Kamorta-Car Nicobar-Port Blair. The helicopter was certified serviceable by AME after the BFFinspection. The flight crew accepted the helicopter as per the procedure after the pre-flight medical, however the crew did not undergone BA test. The helicopter got airborne from Port Blair at 02:45 UTC with 06 passengers onboard and reached Car Nicobar at 04:05 UTC, 03 passengers disembarked the helicopter from the starboard side at Car Nicobar. Thereafter refuelling was carried out and the helicopter took-off with other 03 passengers on board. Both Pilots reported that they had carried out the external checks, pre-take off checks, the closing and locking of doors prior to operating flight at Car Nicobar.

The helicopter took off from Car Nicobar at 04:15 UTC for Teressa helipad and reached Teressa helipad at about 04:50 UTC and 03 passengers boarded the helicopter from the starboard side out of which one passenger who was seated on the last row near LH sliding door was facing difficulty in putting on the seat belt. The Co-pilot went to the Port Side and opened the LH sliding door and after assisting the passenger he had closed all doors (LH & RH). The helicopter then took-off from Teressa and reached Katchal helipad at 05:10

UTC**.** At Katchal 02 passengers boarded the helicopter from the starboard side and they seated in the last row. The port side doors were not opened and closing of doors were carried out by the co-pilot. The helicopter then took off from Katchal with 08 passengers on boardand during flight the last row passengershad observed continuous vibrations from the LH sliding doors. The helicopter reached Kamorta helipad at about 05:25 UTC. At Kamorta 03 passengers were disembarked from the Starboard side. The port side door was not opened. As there were no passengers boarded from Kamorta, all 03 passenger in the last row were shifted to the front row. There were total of 05 passengers onboard, out of which 03 were seated in the front row and the other 02 were seated in the middle row. The co-pilot had stated that he again carried out the pre-flight transit checks including the closing of RH doors during transit inspection. The helicopter then took off from Kamorta helipad with 05 passengers on board for Car Nicobar. The distance between Kamorta and Car Nicobar was around 80 NM.All the sectors from Port Blair and till Kamorta Helipad were uneventful. However at About 35 NM from Kamorta while flying at 136 Kts both pilots experienced some vibrations for a few seconds and the pilot reduced the power and also the speed. Soon after a loud bang sound came from the cabin and they observed that the port side rear sliding door and flap door had flown off. The same was also confirmed to the Pilots by one of the passenger who was seated in the middle row near LH door.The PIC decided to divert the helicopter to the closest helipad, Chowra, which was about 6 NM away from the incident point. Accordingly, Car Nicobar ATC was informed and precautionary landing was carried out safely at Chowra helipad at around 06:00 UTC. There was no injury to any person on board the helicopter or any person on ground and there was no fire.The weather at the time of incident reported by flight crew was visibility 6 Km and Winds 182^{o}/10 Kts. On landing it was seen that the Port side Sliding and Flap door had flown off and the portion of the sliding door railing had sheared off from the front where the sliding door stops. The incident was also informed to the PHL Base Manager, Port Blair by Pilots from Chowra helipad. Another Helicopter VT-ELK was deployed to Chowra helipad at about08:30 UTC and all 05 passengers and the flight crew were taken first to Car Nicobar and subsequently to Port Blair. After 02 days i.e. on 22.11.2013 one of the Chowra islanders had found the flap door from the sea coast in damaged conditions and he handed over the same to the Security Officer in charge of the Chowra helipad. The same was then handed over to the investigating team for investigation.

1.2 Injuries to persons:

Injuries	Crew	Passengers	Other
Fatal	Nil	Nil	Nil
Serious	Nil	Nil	Nil
~~Minor~~/None	02	05	Nil

1.3 Damage to aircraft:

The following damages were observed on the helicopter:-

1) LH Sliding door Upper rail had a tear near the forward end from where the LH Door upper front roller got detached.

2) LH Sliding door lower rail had two curved displacement near the forward side due to the rollers came out forcing through it.

3) The hinges of the Flap door were found broken with the end pieces fastened, no structural damage found on the inside of screwed pieces.

4) A small dent of 30mm x 20mm in width and 2.5mm depth with no tear was found rear of the fuelling point between station 4630 and station 6630.

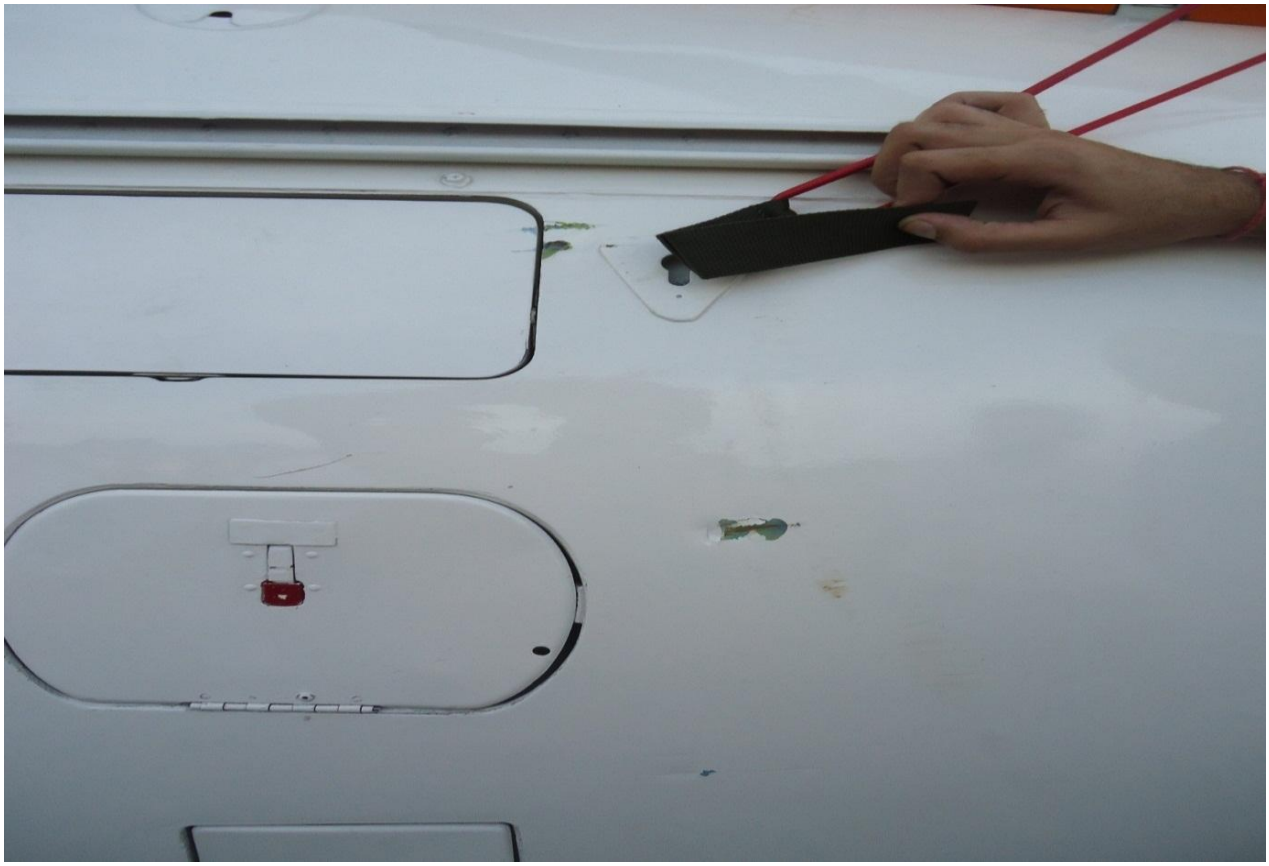
5) Minor scratch marks withdent on the fenestron 2 O' Clock position (behind the refueling point and outside the on port side) with a width of 7 mm and 1.35 mm dept.

6) LH Flap door was recovered from sea coast later in damaged condition which was cracked in the middle portion.

1. Portion of LH sliding door Upper Rail had a tear near the forward end.

2. LH Sliding door lower rail had two curved displacement of the upper side rail near the forward end due rollers being forced through it.

3. Flap door locking plates(upper & lower) were sheared off.



4. Small Dents and marks rear of the refueling point.

5. Small Dents and Rubbing marks over 2 O'Clock position on the Fenestron.

6. Damaged Flap door recovered from the Sea Coast on 22.11.2013.

1.4 Other damages: Nil

1.5 Personnel information:

1.5.1 Pilot-in-Command:-

Type of Licence/ Date of Issue	Flying under rule 160/ 20th August 2007
Age	52 years
Date of Med. Exam/Valid upto	06th February 2014
Date of last Simulator Training	16th September 2013
Date of last IR	21st April 2013
Total flying experience	4628:35 Hrs
Total flying experience during last 180 days	226:05 Hrs
Total flying experience during last 90 days	130:15 Hrs
Total flying experience during last 30 days	08:55 Hrs
Total flying experience during last 07 Days	08:55 Hrs
Total flying experience during last 24 Hours	04:30 Hrs

The PIC had flown 1782:55hrs while serving Indian Army onChetak and Cheetah helicopters as fully operational Pilot including Single Pilot during his 23 Years of service till17.09.2007

when he came on deputation to M/s. Pawan Hans Ltd. The PIC took premature retirement from Indian Army on 14.09.2010 and joined M/s. Pawan Hans Ltd. After having done the required ground training and passed DGCA Exam on SA365N (Dauphin) and started flying as PIC w.e.f. May, 2008. He had flown as PIC in all the sectors of Northern Regions of M/s. PawanHansLtd. for the last five Years and has about 3000 hours experience on type.

1.5.2 Co-Pilot:-

Type of Licence/ Date of Issue	Flying under rule 160/20th August 2007
Age	46 Years
Date of Med. Exam/Valid upto	08th January 2014
Date of last simulator training	12th to 16th September, 2013
Date of last IR	07th January. 2013
Total flying experience	4153:10 Hrs
Total flying experience during last 180 days	215:10 Hrs
Total flying experience during last 90 days	142:20 Hrs
Total flying experience during last 30 days	83:05 Hrs
Total flying experience during last 07 Days	12:40 Hrs
Total flying experience during last 24 Hours	05:10 Hrs

1.6 Aircraft Information:

Name of Operator	M/s Pawan Hans Ltd
Aircraft Type	DAUPHIN 2 SA 365 N HELICOPTER
Registration Marking /M.S.N	VT-ELR/ 6268
Year of Manufacture	30.04.1987
Validity of C of A, Category/Sub-division	03.03.2014 Normal/ Passenger
Total Flying Hrs / Cycles since manufacture as on 20.11.2013	A/F 19135:42 Hrs Landings:-76562 Engine 1: 15201.39 Hrs Engine 2: 11401.09 Hrs
The lastmajor check/inspection carried out on the helicopter	3000 hrs/6 Yrs

Total Flying Hrs at Last major periodic inspection	18997:47 hrs on 28/09/2013
Last periodic inspection	100 hrs/06 months on 09/11/2013

The details of basic weight schedule were as follows:-

	Actual	**Maximum permissible**
Take-off weight	3353 Kgs	4000 kg
Landing Weight	3273 Kgs	4000 kg
Number of Passengers	05	11
Crew	02	02

Dauphin SA 365 N helicopter is a twin engine helicopter fitted with Arriel 1C engine and is manufactured by Eurocopter, France. The helicopter is certified in transport category, for day and night operation under VFR & IFR. The maximum operating height under IFR of this helicopter is 15000 feet and maximum takeoff weight is 4000kg. Helicopter length is 13.45 meter and width is 3.21 meter, height of this helicopter is 4.01 meter.The helicopter is approved in the "Transport" category under FAR 29 amendment 16 category B & category A.

Construction:

The structure of the helicopter Dauphin is sandwich design stressed structure, carbon fabric (Fenestron Fin and horizontal stabilizer), composite (form of Nomex sandwich) glass cloth or Kevlar cowling and faring.

The primary structure includes transmission deck, engine check strong frames, forward structure, body structure and aft structure. The new design structure stiffened plates replaced by NOMEX honeycomb panels with light alloy skin (lighter and more resistant material). The main rotor shaft suspension bars is attached to two strong frames of the body structure.

The tail structure includes tail boom, horizontal stabilizer and side fins, Fin and tail rotor guard. The NOMEX honeycomb tail boom with light alloy skin, the tail boom, which may be disassembled, is bolted to the aft structure junction frame. It has high strength composite material fenestron fin. The stabilizer comprises of a one-piece carbon fabric, horizontal stabilizer which passes through the tail boom and two NOMEX sandwich structure side fins

along with glass fibre tail rotor guard. The Secondary structure includes firewall, console, cabin floor, Luggage hold doors, Electric Equipment Racks and firewalls.

Dauphin SA 365 N helicopter VT-ELR S/N 6268 has been manufactured on 30/04/1987. The Helicopter VT-ELR was registered under the ownership of M/s PHL on 12/08/1987 Certificate of registration No.2326 under category 'A'.

The certificate of airworthiness Number is 1892under "normal category" sub-division passenger was issued by DGCA on 12/08/1987 and specified minimum operating crew as two. The maximum authorized all up weight is 4000Kgs. The C of A was valid upto03/03/2014 The Helicopter was flown with Aero Mobile Licence No. A-020/017-RLO and is valid upto31/12/2016. This helicopter was operated under Non-scheduled operator's permit No.02/1998 and was valid upto15/03/2015. Helicopter Dauphin SA 365 N helicopter VT-ELR has logged 19133:57A/F Hrs as on 19th November 2013.

The AS 365 N helicopter and its Engines are being maintained as per the maintenance program consisting of calendar period based maintenance and flying Hours/ Cycles based maintenance as per maintenance program approved by Regional Airworthiness office, Western Region Mumbai.Accordingly, the last major inspection done was3000 Hrs/06 years inspection at 18997:47 A/F Hrs on 28/09/2013.

The helicopter was last weighed on 11/02/2010at Mumbai and the weight schedule was prepared and duly approved by DAW, Western RegionMumbai. As per the approved weight schedule the empty weight is 2628.00 Kgs, maximum fuel capacity is 896 Kgs. Maximum permissible load with 02 pilots, fuel and Oil tank full is 306 Kgs. Empty weight CG is 4.1025 meter aft of reference in land configuration. As there has not been any major modification affecting weight & balance since last weighing, hence the next weighing was due on 10/02/2015. Prior to the incident flight the weight and balance of the helicopter was well within the operating limits.

As per the records available all the concerned Airworthiness Directive, Service Bulletins, DGCA Mandatory Modifications on this helicopter and its engine have been complied with as & when due.

The last fuel microbiological test was done on 14/11/2013 at DGCA approved facility and the colony count was within acceptable limits.

The Dauphin SA 365 N helicopter is fitted with two Turbo shaft Arriel 1Cengines manufactured by Turbomeca, France. VT-ELR was fitted with LH Engine S/N 2133 and had logged with 15199:54 Engine Hrs, 25444.25Ng cycles and 16309FT cycles respectively. The RH Engine installed is S/N 2146and had logged 11039:24 Engine Hrs,16037.95Ng cycles and 15099FT cycles.

The SA 365 N helicopter VT-ELR is fitted with 4 Main Rotor Blades having a SLL of 20,000 Hrs.

MAIN ROTOR BALDES		
P/N	**S/N**	**COMP.HRS**
365A11-0050-07	6753	16061:25
365A11-0050-07	9933	4918:44
365A11-0050-09	11331	2440:18
365A11-0050-09	11334	2440:18

The status of all Airworthiness Directives as issued by DGCA through mandatory modifications for Helicopter including Main Rotor blades were also checked and found satisfactory.

Prior to incident flight there was no pending/repetitive defect entered on the Pilot Defect Report/Technical Logbook of the helicopter.

Sliding doors/flap doors are non serialised items. M/s PHL has no procedure of recording of replacement/cannibalisation of these items.

Description of Sliding &Flap Door

1. General

   Dauphin helicopter has a total of 6 doors, one door on each side for Pilot and two doors on each side of passengers.Two Sliding doors, located on both sides of the helicopter, may be locked in forward(closed) or aft(open)position in flight, as required. The doors are fitted with mechanism which ensures the following functions.

   -Opening & Closing

   -Sliding of door between its two locking position.

   -locking in open position.

   -locking in closed position.

The sliding doors are fitted with mechanical indicating device consisting of a Red flag visible from the Pilot's seat, from the inside and outside.

With the sliding door, fixed sub-doors(flap doors) are installed instead of removable sub doors and fitted with transparent panels jettisonable from inside and from outside.

2. Description and Operation.

2.1 Description of the doors.

The sliding doors include the following assemblies:

- a light alloy square cross-section welded frame
- acentre cross-beam and a set of stiffeners
- a metal skin panel covering bottom section of the door
- an internal trimming
- two composite material outer and inner frame edgings in the upper section of door permit an jettison able transparent panel to be secured by mean of a pull-out seal.

Handles located on either side at the doors permit doors to be manoeuvred from inside and outside and the aircraft. Cover strips ensure the sealing of the door against the rubber seals on the structure.

Upon closing, a latch enables the door to become integral with the frame.

2.2 Lateral sliding

Three fittings complete with sliding assemblies are secured to the door structure and ensure sliding and guiding of the door on the tracks.

- The upper fitting supports a catch provided with a roller which slides in upper track.

- The outer fitting supports a roller carriage which slides in the centre track.

- The lower fitting supports a roller carriage which slides in the lower track.

When the door is pushed fully aft, a locating plate which is secured to the edge of the door fits over a pin located on the structure. These devices guide the door at the end of its travel and limit vibration in flight when the door is locked open.

3. Mechanisms

3.1 Opening and closing mechanism

The doors held closed by a bolt which slides into a latch secured to the rear fixed panel, this bolt, which permits door closing/opening, is controlled:

- From the outside by pushbutton which passes through the handle. A barrel-type lock incorporated in the pushbutton permits the door to be locked with a key.

-From the inside by a lever which controls a rod which is connected directly to the lock bolt.

3.2 Mechanisms locking door in open and closed positions

The door is locked in its closed position by the sliding assemblies in their respective tracks and by the closing device.

A latch controlled from the helicopter inside or outside enable the door, when closed and locked, to become integral with the frame via a finger which encloses into catch.

The door is locked in its open position by a spigot that engages into a latch secured on the helicopter structure and by a catch anchoring on a stop secured to the centre track. The latch is actuated by the outer handles for unlocking of "Door Open" position. It is automatically released by a spring on the stop during door opening.

3.3 Protective device

A fitting located on the aft vertical member of the door, supports a rubber block which protects the door in its aft-ward movement from knocking against footsteps which may be positioned downwards.

3.4 Transparent panel jettisoning mechanism

The transparent panel is held in place by means of a junction channel incorporating two pull-out seals permitting seal to be removed by extracting either of the two strips.

4. Sub-doors(Flap door)

4.1 General

The fixed sub doors (Flap doors) are located forward of frame 4630 on either side of the fuselage.

4.2. Structure

The structure includes:

- A foam panel with Kevlar fabric skin and edgings overlapping the seals on the helicopter structure.
- A light alloy clamp
- Lock plates picking up the panel.

Clamp is fitted with two mechanically controlled locks secured to the upper and lower parts of a striking box permitting closure of sliding door on the sub doors.

- A light alloy channel secured to the panel guides the sliding door.

4.3 Attachment

The sub door is held in "closed" position by the upper and lower locks (the lock pin engages in a anchor fitted which is secured to the floor) and the two lock plates.

1.7 Meteorological Information:

The Andaman & Nicobar Islands are situated in Bay of Bengal, south of West Bengal. The region has a total of three Meteorology Sections. Ones at Port Blair and Campbell Bay are manned by Indian Navy personnel and the one at Car-Nicobar by Indian Air Force personnel. The islands are located in the region between 07 Degrees to 11 Degrees North latitude and is thus subjected to active monsoon conditions in both Southwest as well as Northeast monsoon between May to September and November to December respectively.

The Met Briefing is obtained from the Port Blair MET Section which provides T-3 and Satellite pictures. All the airfields communicate the weather and thus weather at any of the airfield along with forecast is available at all the times.

The reported Met Conditions at Car Nicobar airfield on 20th Nov 2013 at 10:00 hrs (IST) were as follows: - Visibility 6 Km Wx- Cloudy 4 to 6 Octas Few (1 – 2 Octa) 1800 QNH 1008.

1.8 Aids to Navigation:

The Flight crew were flying under VFR.There is no evidence to indicate that VT-ELRexperienced any navigational problem during the flight.

1.9 Communications:

There was always two way communications between the helicopter and the ATC.

1.10 Aerodrome information: N/A

1.11 Flight recorders:

Make: Honeywell

Part No: 980-6021-066

Serial No: 00741

The entire mandatory parameter recordings of DFDR have been found logical.

The Flight Crew did not carry out CVR CB pull out immediately after the helicopter was safely parked on Chowra Helipad. Due to delayed action by the Pilots the vital CVR recordings was not available for a period of 01 hrs 56 minutes and only last 4 minutes of post landing at Chowra helipad was available which was not audible as the discussions were outside the helicopter.

1.12 Wreckage and impact information.

The LH sliding door along with the flap door sheared off and got disengaged from their position in flight. However after 2 days of the incident i.e. on 22.11.2013 one of the Chowra islanders had found the LH flap door from the sea coast. The flap door was cracked near middle portion. There was a scratch observed near fenstrom area indicating some LH door part had hit when it came off the helicopter.

1.13 Medical and pathological Information:

The flight crew had undergonepre-flight medical **without BA** test.

1.14 Fire:

There was no fire.

1.15 Survival aspects:

The incident was survivable.

1.16 Tests and research:

The LH Flap door, one upper rail, one lower rail and miscellaneous hardware of the door were sent to the Failure Analysis laboratory, Aircraft Engineering Directorate, DGCAHQrs, New Delhi to ascertain probable cause of failure.

Laboratory Examination

Visual & Macro Examination

All the parts were examined under the stereo-microscope up to a magnification of 50X. The part- wise detailed observations are as follows:-

Left Reinforced Rail. Part No. 365A21-0544-0801

Both ends of the lower rail along with complete rail portion were examined on the microscope as shown in Fig. 1(a) & 1(b). On one end, there is an evidence of excessive load/ oversize marking of the roller as shown in figure:-

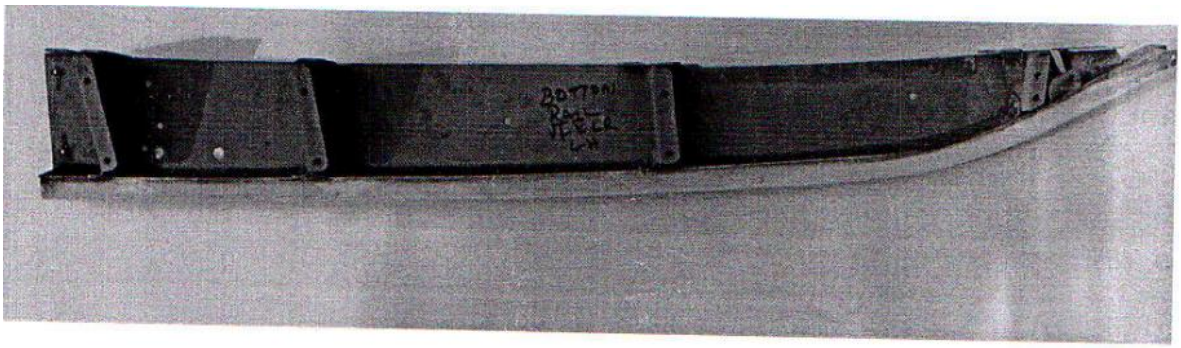


Fig. 1 (a)

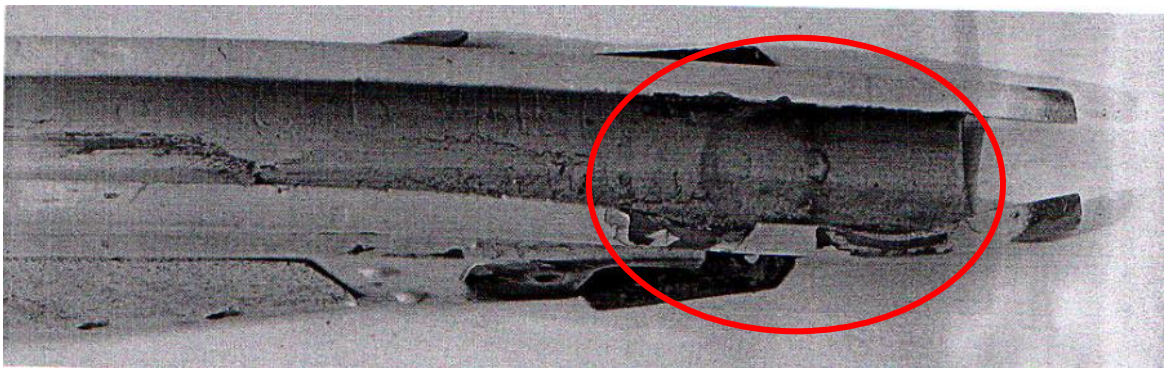


Fig. 1 (b)

Upper Rail P/N 365A87-3021-1201

Complete rail portion was examined on the microscope as shown in Fig 2(a) & 2(b). It was noticed that on one end, some portion of the rail was found bent. After straightening the bent portion, it was found that some portion ('V' shape) was missing as shown in Fig 2(c) & Fig 2(d). It appears that this portion might have gone missing after fracture during the helicopter operation, the remaining mating portion of 'V' shape was cut to observe the fracture surface. The same was prepared for detailed examination after cleaning with acetone. Fig. 3(a) 3(b) are the fractographs indicating the slowly developed progressive crack originating from bolt hole followed by final overload fracture.

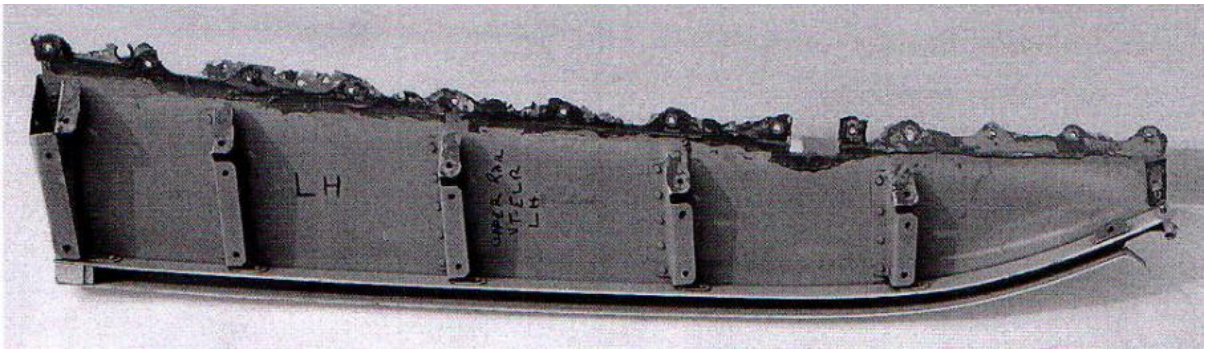


Fig. 2 (a)

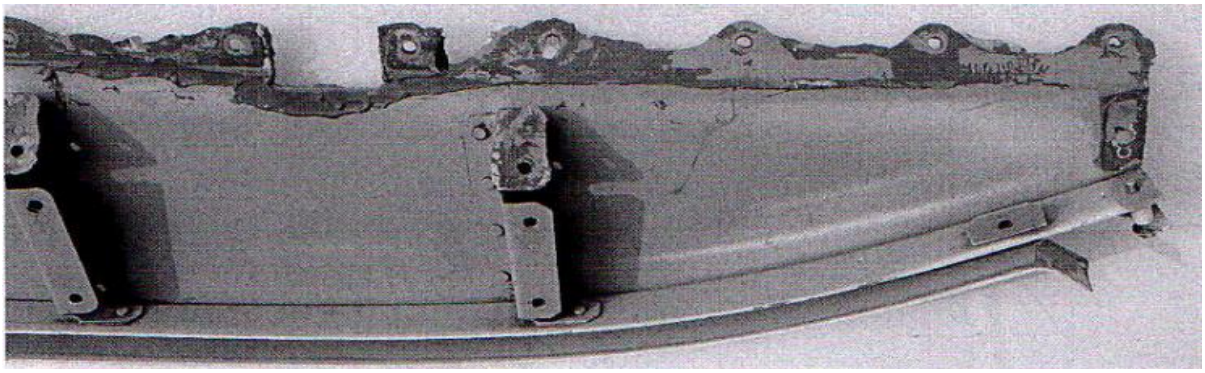


Fig. 2 (b)

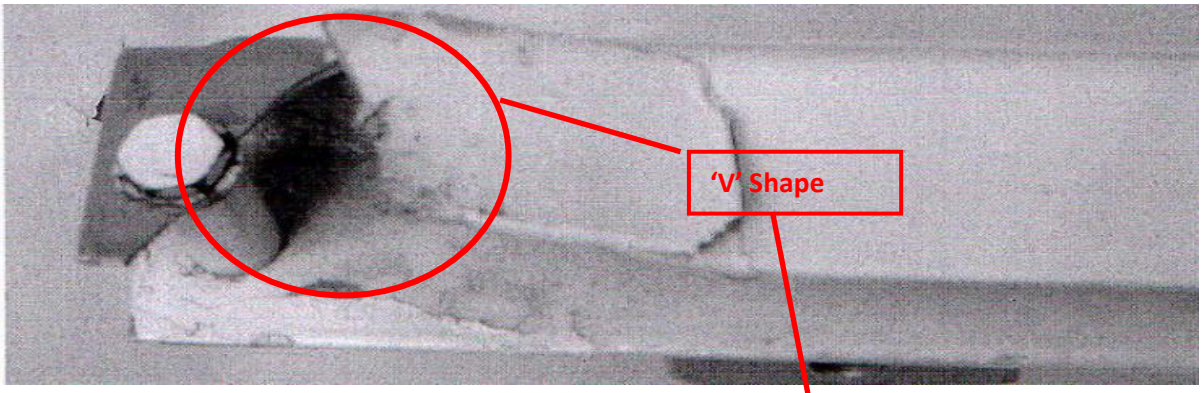


Fig. 2(c)

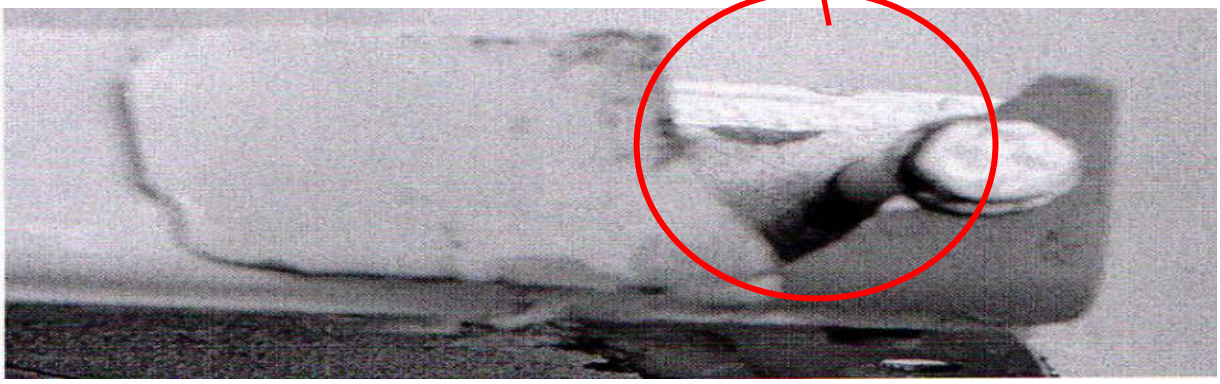


Fig. 2(d)

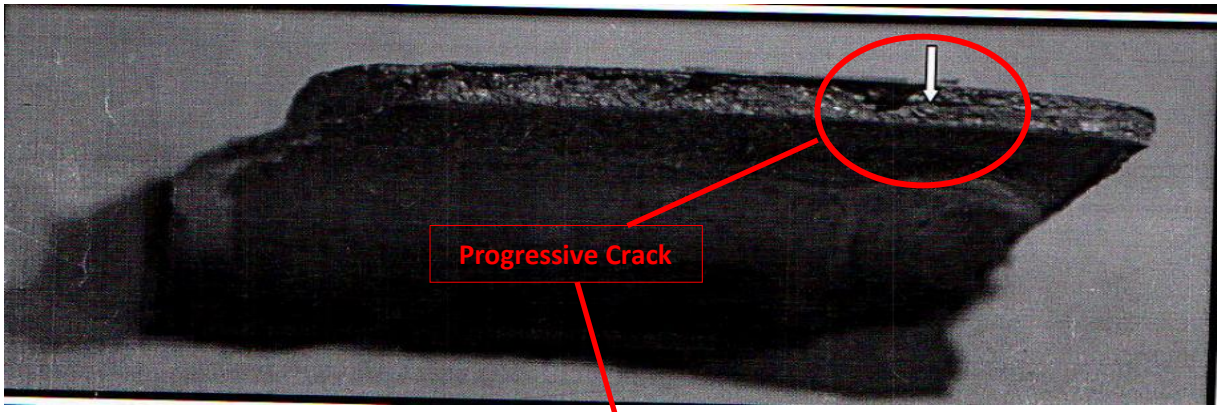


Fig. 3 (a)

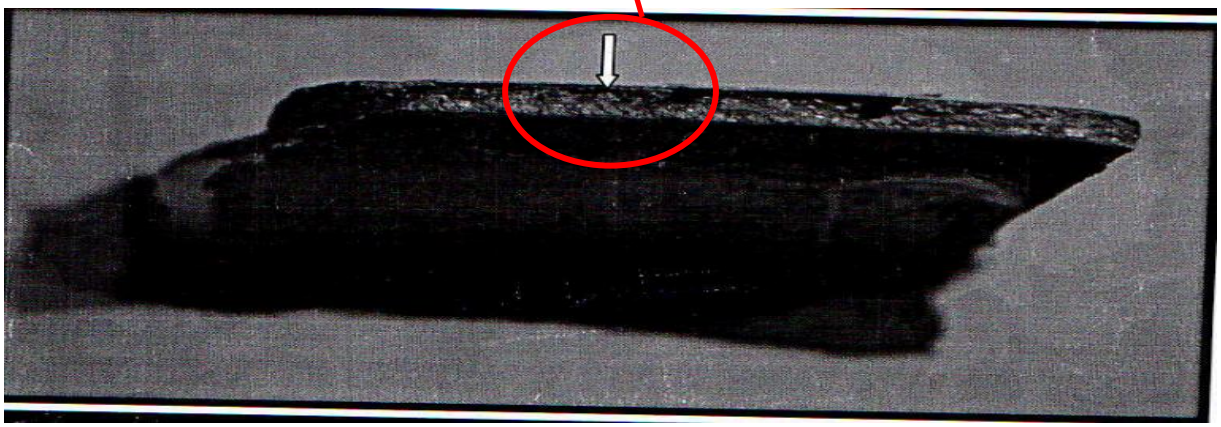
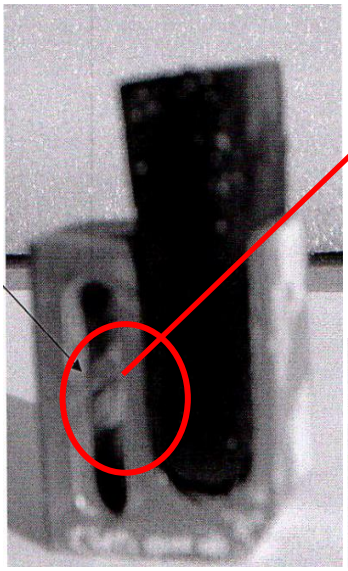


Fig. 3 (b)

Sliding Door Stop & Screw

Sliding door stop & screw was studied on the microscope as shown in fig. 4(a) & 4(b). Some threads markings were observed at the entry point of the slot perhaps due to misalignment of stop & screw during the service. Initial portion of the screw threads were found worn out. On the remaining threads, black soot was found deposited.



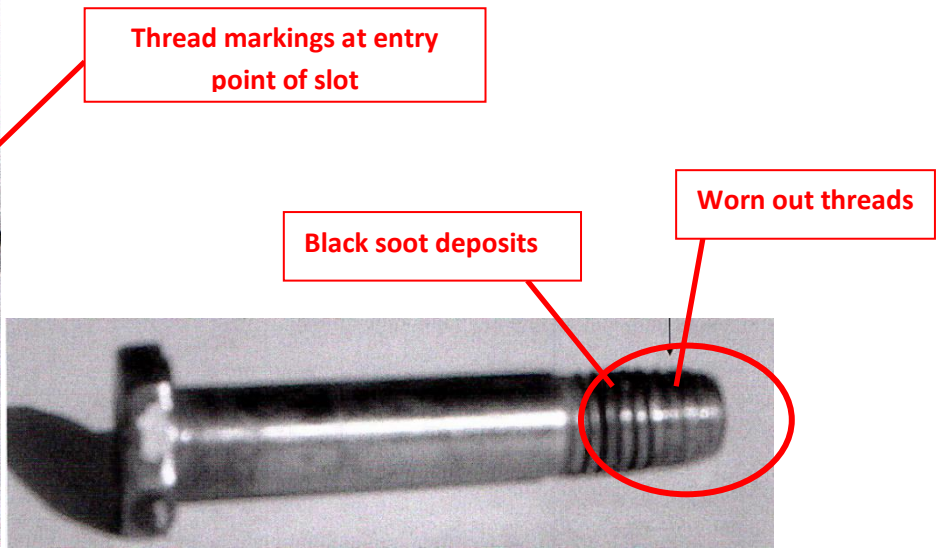


Fig. 4(a) Fig. 4 (b)

Door (Flap) Centre Lock & sliding door lock

Door and its part were studied on the microscope as shown in fig. 5(a), 5(b), 5(c), 5(d), 5(e) and 5(f)

Flap door& Centre Lock for Sliding Door

Flapdoor is shown in fig 5(a) & 5(b). After inspection, it was found that door was cracked from the middle (approx.), which is perhaps due to bending of door post incident.

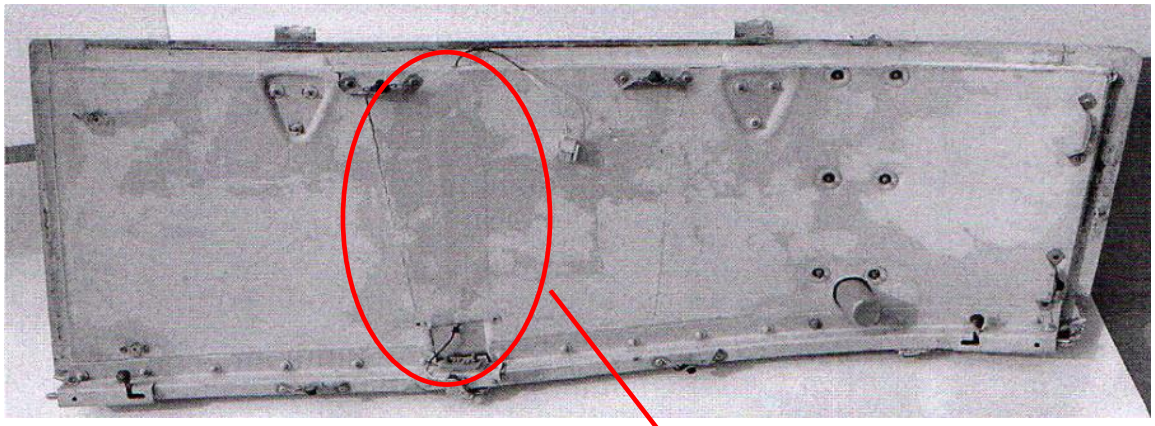


Fig. 5 (a)

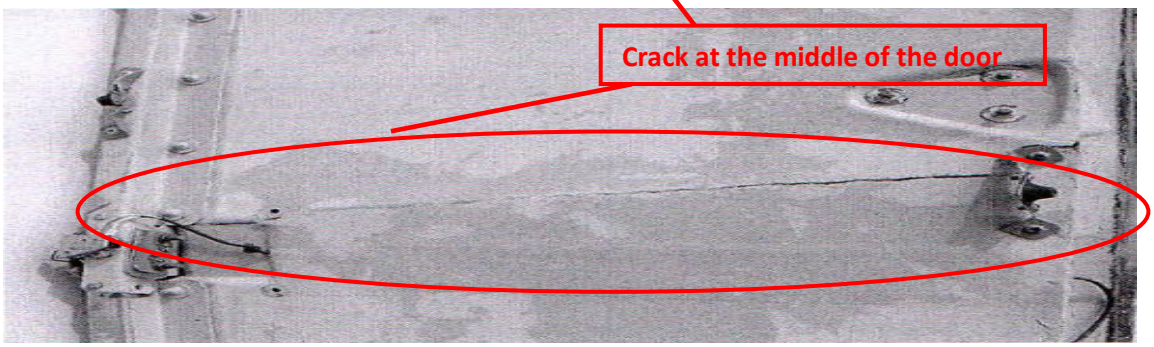


Fig. 5 (b)

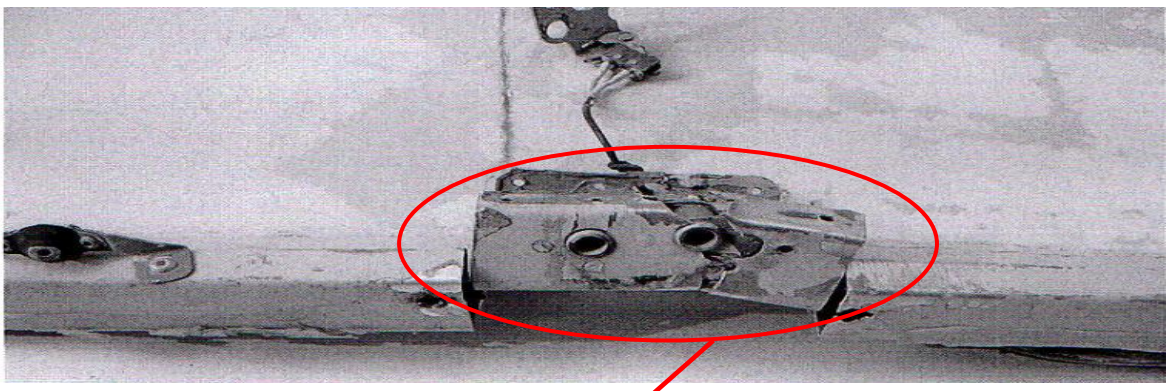


Fig. 5 (c)

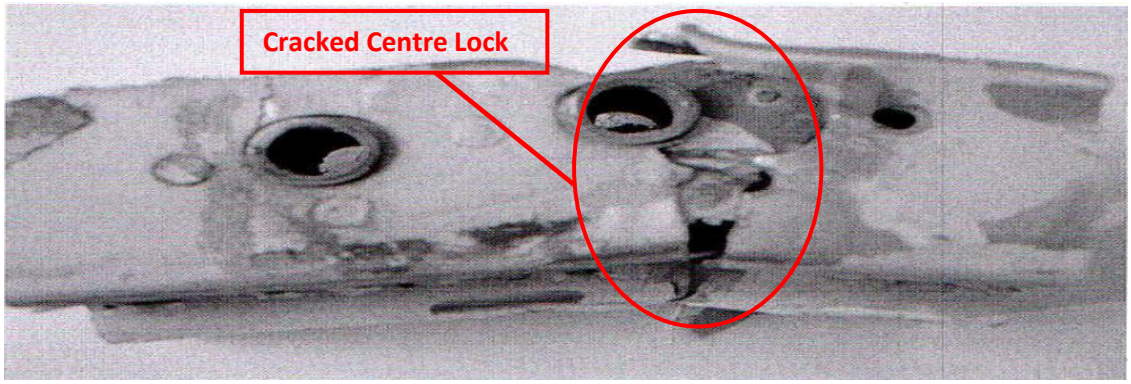


Fig. 5 (d)

Examination of the centre lock revealed that it has cracked (fig. 5d).

Spring loaded Latches

Spring loaded Latches were available on the both sides of the door as shown in fig 5(e) &5(f). Both latches were found in intact condition as shown in figures.

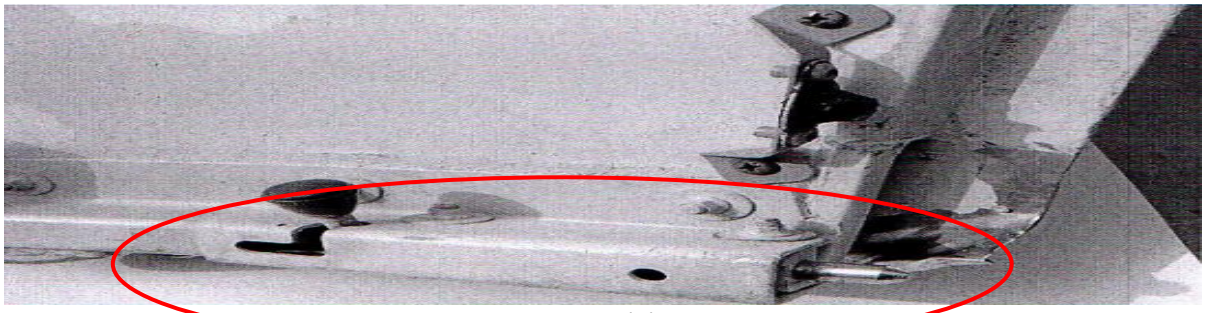


Fig. 5 (e)

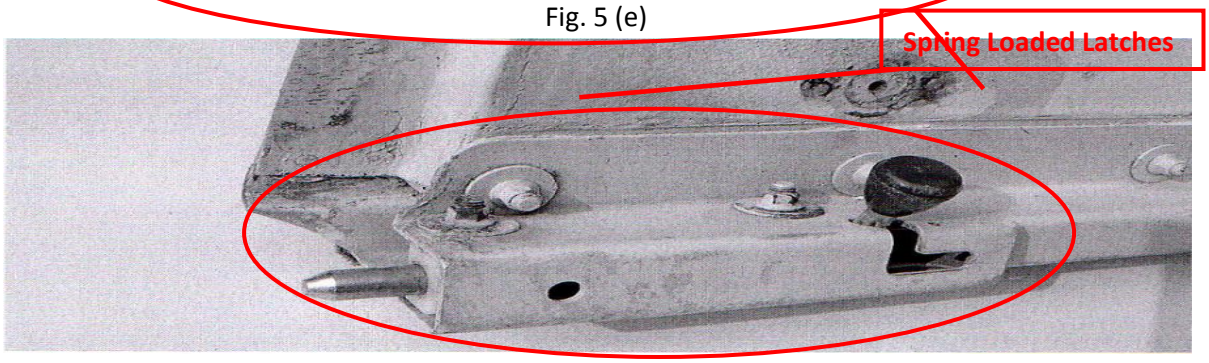


Fig. 5 (f)

Door Hardware

During the examination, the door hardware was found in satisfactory condition.

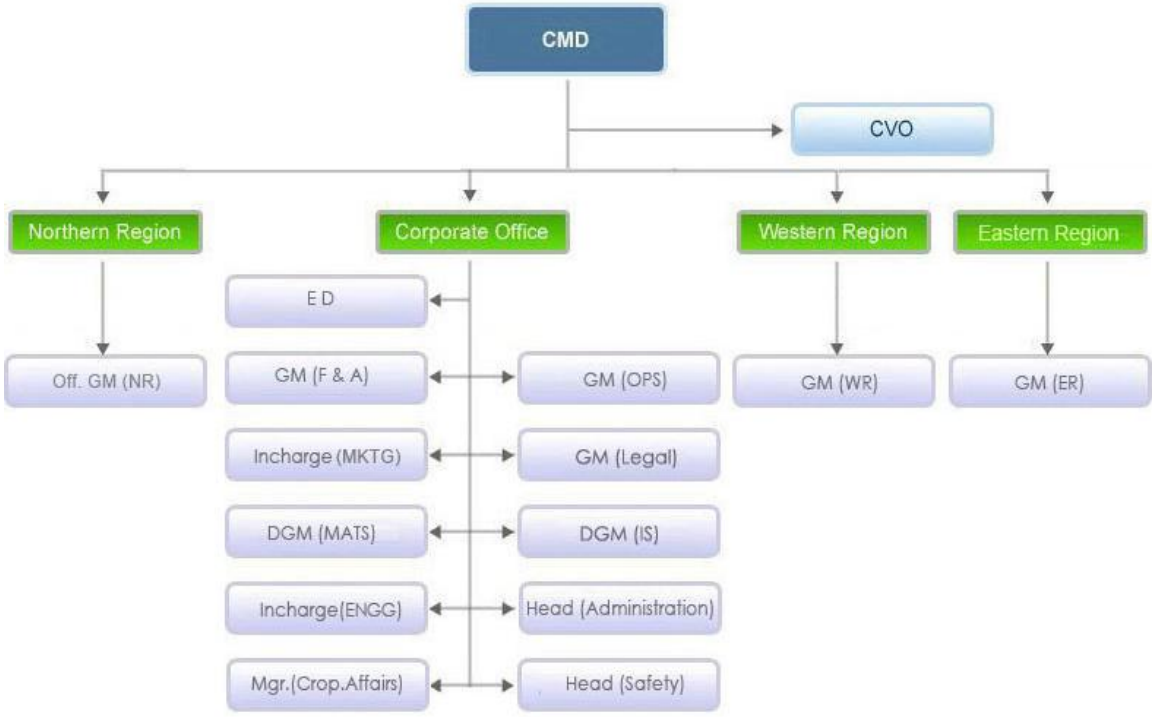
Observation:

The missing(V-shape) portion was found to be cracked in a progressive manner as shown by smooth fracture on available fracture surface which has probably initiated from the bolt hole, the bent portion of rail shows that overload might have caused the bend resulting into detachment of V shaped portion.

The fixed door and its central lock was found cracked probably due to post failure damage.

1.17 Organizational and management information.

M/s. Pawan Hans Ltd.was incorporated in Oct.1985 as a company under the provision of the Companies Act, 1956.M/s Pawan Hans Limited operates under Non Schedule Operator's Permit No. 02/1998 valid up to 15/3/2015. As per Air Operator Permit M/s.PHL has a balanced fleet of 48 helicopters consisting of Bell 206 L4, Bell 407, Dauphin SA365N, Ecureuil AS350B3, Dauphin A65N3 and Mi-172. It has the biggest operation of helicopters to the off shore for oil rig platforms. M/s PHL is also engaged in contracts with number of state governments for providing helicopter services. PHL provides helicopter service at high altitudes for the pilgrims visiting Amarnathji caves in Srinagar, Mata Vaishno Devi shrine at Katra, Jammu & Kashmir, Kedarnath&Badrinath in Uttrakhand etc. M/s PHL has a Helibase established in Veer Savarkar Airport at Port Blair in the Andaman & Nicobar administration hanger and dispersal for conducting scheduled flights of the Andaman & Nicobar Administration. The daily flying operations are carried over the Andaman sea area and includes take-off/landings from service airfields/helipads such as Port Blair, Car Nicobar, Campbell Bay, Kamorta and the other helipads in the Islands as per the schedules published by Andaman & Nicobar Administration. The organisation chart of M/s PHL is as follows:



1.18 Useful or effective investigation techniques: Nil

1.19 Additional Information:

1.19.1 Dauphin Door Operations:

Dauphin helicopter has a total of 6 doors, one on each side for Pilot and Two doors on each side for passengers. All doors have closing mechanism and a locking mechanism. Electrical and Mechanical devices are provided in the Helicopter to indicate to the Pilots that all doors are closed and locked.

Closing: A yellow indicator light 'DOORS' on the caution advisor panels indicated the closing and opening of the doors. The system comprises of electrical circuitry installed with micro switches.

When all doors are properly closed the micro switches cut off the electrical supply to the door indicator and light goes off. In case a door is not properly closed the relevant micro switch energizes the supply and indicator light comes ON.

Locking: The correct locking of the door is checked by mechanical devices only. The mechanical indicating device is comprising of a red tell-tale indicator is installed on the upper portion of the doors Pilot, Co-Pilot and Sliding Doors. The position of this indicator can be easily be seen by the passengers and the Pilot to confirm that the doors are locked.

When the door is locked the tell-tale indicator is not visible ensure the proper locking of the door. In case the tell-tale indicator is visible the door is unlocked. The doors can be locked from inside the helicopter as well as from outside.

1.19.2 Deactivation of Cockpit Voice Recorder after landing

As per the Standard Operating Procedure of M/s PHL, CVR of Dauphin SA 365 N helicopteris equipped with a switch in the cockpit which needs to be pulled out by the pilots after landing to de-activate CVR. De-activating of CVR after landing is required to prevent continuous recording, which results in loss of complete CVR flight data of last flight within two hours of switching off the helicopter. In the present casethe same was not followed by the pilots and due to delay in action by them the vital CVR recordings was not available. Hence the flight crew did not follow the existing procedures on deactivation of CVR switch which resulted in loss of vital investigation data/evidence.

2.ANALYSIS

2.1 Serviceability and Performance of the Helicopter:

Dauphin SA 365 N helicopter VT-ELR S/N 6268 has been manufactured on 30/04/1987. The Helicopter VT-ELR was registered under the ownership of M/s PHL on 12/08/1987with Certificate of Registration No.2326 under category 'A'.The Certificate of Airworthiness Number is 1892 under "normal category" sub-division passenger was issued by DGCA on 12/08/1987and was valid upto03/03/2014. The Helicopter was flown with Aero Mobile Licence No. A-020/017-RLO and is valid upto31/12/2016. This helicopter was operated under Non-scheduled operator's permit No.02/1998 and is valid upto15/03/2015. This Dauphin SA 365 N helicopter VT-ELR has logged 19133:57A/F Hrs as on 19th November 2013. The last major inspection done was3000 Hrs/06 yearsinspection at 18997:47 A/F Hrs on 28/09/2013.Last 100 hrs/06 months inspection (it includes 50hrs/02 months and 25 hrs inspection) was carried out on the helicopter airframe on 10.11.2013 at 19092:32 hrs as per approved inspection schedule.Scrutiny of the snag register did not reveal any snag relevant to the incident. Load and Trim sheet of the sector revealed that the take off/landing weight and CG of the helicopter was within the prescribed limits. As per the records available the AME performed ALF inspections as per approved inspection schedule at 19131:42 A/F hrs on 19.11.2013, including all doors,rails and rollers for security, attachments & door operations and reported satisfactory. On 20.11.2013 the AME performed BFF inspection as per approved schedule including sliding door security, attachments and operation of door were checked and reported satisfactory. No defect/snag regarding door operations was reported during above maintenance checks. After releasing of the helicopter on 20.11.2013 the helicopter VT-ELR had flown approx. 02:00 hrs and made four normal landing uneventfully prior to the incident. However after the incident the LH Flap door, one upper rail, one lower rail and miscellaneous hardware of the door were examinedwhich revealed that the missing(V-shape) portion of the upper rail was found to be cracked in a progressive manner which was evident by smooth fracture on available fracture surface which has probably initiated from the bolt hole.The bent portion of rail was probably due to overload which might have caused the bent resulting into detachment of 'V 'shaped portion. The fixed door and its central lock were found cracked probably due to post failure damage.

From above it is inferred that the failure of the portion of upper rail was of slowly developed progressive nature, hence serviceability of the helicopter is a factor to the incident.

2.2 Pilot Handling of the Helicopter:

On 20.11.2013 Helicopter VT-ELR was scheduled to operate inter-island flights on route Port Blair- Car Nicobar- Teressa – Katchal – Kamorta - Car Nicobar - Port Blair**.** The PIC accepted the helicopter as per the procedure. The helicopter when reached Teressa from Car Nicobar 03 passengers boarded the helicopter from the starboard side out of which one passenger who was seated on the last row near LH sliding door was facing difficulty in putting on the seat belt. The Co-pilot stated that he went to the Port Side and opened the LH sliding door and after assisting the passenger he had closed all doors (LH & RH). The helicopter then carried out flight from TeressatoKatchaland from theretoKamorta. At all these stations passengers embarked and disembarked the helicopter from Starboard side andthe port side doors were not opened. At Kamorta 03 passengers disembarked from the Starboard side. The port side door was not opened. No passengers boarded from Kamorta, all three passengers in the last row were shifted to the front row. There were total 05 passengers onboard, out of which 03 passengers were seated in the front row and the other 02 were seated in the middle row.The helicopter then took off from Kamorta helipad with 05 passengers on board for Car Nicobar.All the sectors from Port Blair and till Kamorta Helipad were uneventful. However at about 35 nautical miles from Kamorta while flying at 136 Kts both pilots experienced some vibrations for few seconds. The pilot then immediately reduced the power and also the speed thereaftera loud bang sound came from the cabin and they observed that the port side rear sliding door along with flap door had flown off. The same was also confirmed to the pilots by one of the passenger who was seated in the middle row near LH door.The PIC then decided to divert the helicopter to the closest helipad, Chowra, which was about 6 Nautical miles away from the incident point. Accordingly, Car Nicobar ATC was informed and the pilot carried out precautionary landing safely at Chowra helipad.

2.3 Weather

The weather report issued by Meteorological Dept, Car Nicobar airfield on 20 Nov 2013 at 0430 UTC were visibility 6 Km Wx- Cloudy 4 to 6 octas Few (1 – 2 Octa) 1800 QNH 1008. The prevailing weather was fine.

2.4 Circumstances leading to the serious incident

The helicopter VT-ELR completed sectors Port Blair- Car Nicobar- Teressa – Katchal – Kamorta uneventfully. Thereafter the helicopter took off from Kamorta helipad with 05 passengers on board for Car Nicobar. During the flight the LH sliding doorupper rail of the helicopter had fracturedand a 'V' shaped portion got detached due to the crack which propagated progressively initiating from the bolt hole resulting in detachment of sliding door front upper wheel from the upper rail. The detachment of sliding door front upper wheel from the upper railcreated excessive air pressurethrough the partially opened door and forced both LH Sliding and flap doors to detach from its security of attachment and flown off.

3. CONCLUSIONS:

3.1 Findings:

1. The helicopter VT-ELR had valid Certificate of Airworthiness and Certificate of Registration.
2. On 20.11.2013 Helicopter VT-ELR was scheduled to operate inter-island flights on route Port Blair- Car Nicobar- Teressa – Katchal – Kamorta - Car Nicobar - Port Blair**.**
3. The flight crew were qualified to conduct the flight. Both Pilot in Command and co-pilot were flying under the privileges of Rule 160.
4. They had undergone the requisite pre-flight medical examination without BA test and they had been certified as not being under the influence of alcohol.
5. The Commander had a total flying hours of 4630 hrs of which 2845 hrs were on type. Co-Pilot had a total flying experience of 4120 hrs of which 2000 hrs were on type.
6. The flight crew had taken adequate rest prior to operating the flights.
7. All navigation and approach aids were functional and were operating normally at the time of incident.
8. There was no snag reported prior to operation of flight relevant to the incident.
9. The takeoff/landing weights and CG of the helicopter were within the prescribed limits.
10. Weather conditions prevailed was fine at the time of incident and hence weather was not a contributory factor to the incident.
11. The helicopter VT-ELR operated Port Blair- Car Nicobar- Teressa – Katchal – Kamorta uneventfully.
12. The Co-Pilot had opened the LH sliding door at Teressa helipad to assist a passenger to put his seat belt ON. Thereafter all the doors were closed by Co-Pilot.
13. Thereafter the helicopter operated Teressa – Katchal – Kamorta uneventfully.

14. However while operating flight from Kamorta to Car Nicobarwith 05 passengers onboard the helicopter experienced severe vibrations.
15. The pilot then immediately reduced the power and also the speed thereafter a loud bang sound came from the cabin and they observed that the port side rear sliding door along with flap door had flown off. The PIC then diverted the helicopter to the closest helipad, Chowra, which was about 6 Nautical miles away from the incident point.
16. After the incident the flight crew did not deactivate the CVR CB as per the company operating procedures.
17. The test results of upper rail revealed that missing 'V' shape portion of the upper rail appears to have failed due to the slowly developed progressive crack followed by final overload fracture.
18. M/s PHL has no procedure for traceability/record of non-serial numbered parts when replaced/cannibalized.

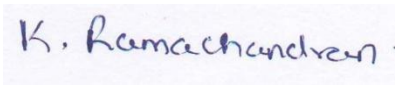
3.2 Probable cause of the Serious Incident:

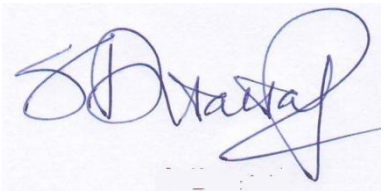
The probable cause of the incident is due to theprogressive failure of upper rail followed by final overload fracture which created excessive air pressure through the partially opened LH door forcing both LH Sliding and flap doorto detach from its security of attachment and consequently resulted into the incident.

4. Safety Recommendations:

4.1 M/s PHL may review the in-house procedures on frequency of inspection on the door operation including its security of attachment.

4.2 M/s PHL may review the in-house procedures for traceability of non-serialized part and shall reflect in the respective log book whenever any such part is replaced/cannibalized.





K. Ramachandran
Air Safety Officer (E)
Member, Committee of Inquiry VT-ELR

S. Durairaj
Deputy Director of Air Safety
Chairman, Committee of Inquiry VT-ELR

Date: 15.10.2015
Place: New Delhi