

FINAL REPORT OF ACCIDENT TO PAWAN HANS
ECUREUIL AS 350 B3 HELICOPTER VT-PHT AT
LUBUTHANG, ARUNACHAL PRADESH ON 30th APRIL 2011

1. Helicopter Type : Ecureuil AS 350 B3
Nationality : INDIAN
Registration : VT - PHT
2. Owner/ Operator : Pawan Hans Helicopters Ltd.
3. Pilot – in –Command : CHPL holder
Extent of injuries : Fatal
4. Co-Pilot : CHPL holder
Extent of injuries : Fatal
5. Place of Accident : Near Lubuthang, Arunachal Pradesh N 27⁰ 34' 05''
E 92⁰ 12'03''
6. Last point of Departure : Tawang
7. Intended place of Landing : Itanagar
8. Date & Time of Accident : 30th April 2011, 0500 Hrs approx
(exact timing not known)
9. Passengers on Board : 03
Extent of Injuries : Fatal
10. Phase of operation : In flight
11. Type of Accident : A case of Controlled Flight into terrain

(ALL TIMINGS IN THE REPORT ARE IN UTC)

SUMMARY

On 30th April 2011 M/S Pawan Hans Helicopters Limited AS 350 B3 Helicopter VT-PHT met with an accident when flying from Tawang Army helipad to Itanagar in Arunachal Pradesh. Initially, the helicopter was declared missing. The crash was confirmed after the sighting of the crash site on 4th May 2011 by Yak herders and subsequently at 0415 hrs by an Indian Air Force Helicopter near Lubuthang village in Arunachal Pradesh.

The accident was investigated by a Committee of Inquiry, appointed by the Government of India, as per rule 74 of Aircraft Rules, 1937. As per obligations under ICAO Annex 13, notification was sent to Bureau d'Enquêtes et d'Analyses, France, who appointed their accredited representatives to associate with the accident investigation.

1. FACTUAL INFORMATION

1.1 History of the Flight

M/S Pawan Hans Helicopters Ltd is a non scheduled Air Transport Operator and also engaged in Helicopter Charter Operations. One Ecureuil AS 350 B3 helicopter has been requisitioned by the Government of Arunachal Pradesh since 5th Dec 2010. This single engine helicopter has a maximum operating altitude of 23,000 feet and has a seating capacity of 04 passengers in the second row of the cabin, in addition to the two-man crew. The helicopter is approved for VFR operations only.

On 30th April 2011 M/S Pawan Hans Helicopters Limited AS 350 B3 Helicopter VT-PHT was positioned for carrying the CM of Arunachal Pradesh and his entourage from Tawang Army helipad to Itanagar.

The helicopter, which was based at Itanagar, was certified serviceable by the AME, after the daily inspection on 30th April 2011 as per the pre-flight task card. The pilot accepted the helicopter as per the procedure. Since Itanagar does not have an ATC or Met facility, the operating crew is required to fax the flight plan to Guwahati ATC. However, the crew was unable to fax the written flight plan to ATC and hence passed the flight plan telephonically to MLC Guwahati. MLC Guwahati in turn passed the flight details telephonically to ATC Guwahati. The flight was issued with a valid ADC and FIC. The crew also obtained the current weather of Itanagar and Guwahati telephonically. The helicopter took off from Itanagar at 0200 hrs and landed at Guwahati. Thereafter, the helicopter was refueled and got airborne from Guwahati at 0316 hrs and landed at Tawang Army helipad at 0406 hrs. The pilot carried out the necessary quality checks on the fuel, refueled 140 litres and repositioned the helicopter for takeoff at the helipad. The helicopter was fully serviceable, as the pilot reported no defect.

The weather at the time of Take Off was reported as Winds 230⁰/05 Kts, Visibility 6000 Metres with Sela Pass partially visible and Bhutan valley clear. The passengers consisting of the Chief Minister of Arunachal Pradesh and three others reported and went through the Army Security. The helicopter obtained clearance to start at 0420 hrs. At 0423 hrs, the helicopter attempted a pick up with four passengers on board. As per the eyewitness (helicopter pilots), in the process of the pick up the helicopter turned through 70⁰ to 80⁰ to the right in an uncontrolled manner. The Captain carried out a sit down and one passenger, OSD to the CM, got down from the helicopter. A second pick up was attempted and another sit down was carried out. This time three pieces of baggage was off loaded from the helicopter. The helicopter carried out another pick up, but had to again sit down as the door of the helicopter was not closed and locked properly. Subsequently, the

helicopter got airborne at 0426 hrs and routed via Banga Janga and Sela pass for Itanagar on an approximate direction of 160 - 180°. The estimated time of arrival at Itanagar was given as 0535 hrs. At 0436 hrs, the pilot reported position as overhead Sela pass. The pilot also reported that Sela pass partially clear and a break through being there in the clouds over Sela. At 0440 hrs, the Captain reported 15 nautical miles clear of Sela pass and changed over the frequency to the valley frequency. At 0623 hrs, the Aviation Officer at Tawang, along with a few personnel from the Tawang Police Control Room came to the ATC at Tawang and informed that the CM's helicopter had not yet landed at Itanagar. The ATC at Tawang took the necessary overdue action of informing PA to DC Tawang, ATC Tezpur, MLC Guwahati, the Air Force authorities at Guwahati and Shillong, Pawan Hans Guwahati and ITBP Tawang.

Search and Rescue (SAR) was initiated but hampered due the inclement weather. The SAR was also delayed by the reports of a phone call received by a Minister, Govt of Arunachal Pradesh and information passed by an MLA from Arunachal Pradesh, stating that the helicopter had landed safely in Bhutan. The same was passed to the ATC at Guwahati by an OSD to the CM of Arunachal Pradesh. Initial reports came in that the helicopter was sighted in Bhutan valley. A considerable amount of time was wasted in searches in the Bhutan valley. However, on correlating the time of observation of the eyewitness, it became apparent that the helicopter had been sighted when it was enroute to Tawang helipad from Guwahati during the positioning flight. The crash site was located on 4th May 2011 by Yak herder tribe of Brokpas who live at and around the area close to Lubuthang in an uninhabited area in the Kamang sector of Arunachal Pradesh at an approx altitude of 4600 metres. No Emergency Transmitter Locator (ELT) messages from Cospas Satellite system were received by the Indian Mission Control Center (IMCC) on

any frequency. All the occupants received fatal injuries due to the helicopter impacting the rocky face of a cliff and subsequently catching fire.

1.2 Injuries to Persons

INJURIES	CREW	PASSENGERS	OTHERS
FATAL	02	03	Nil
SERIOUS	Nil	Nil	NIL
MINOR/NONE	Nil	Nil	NIL

1.3 Damage to Aircraft

The helicopter was completely damaged due to the impact and subsequent fire.

1.4 Other Damage: Nil.

1.5 Personnel Information

The Pilot in Command was an ex-Army Aviation officer. He received his initial flying training at Air Force Academy, Hyderabad. The Pilot joined Pawan Hans on 24th Sep 2007 and initially flew Dauphin helicopter under rule 160. Subsequently, he obtained his CHPL in May 2010. The Pilot was trained at Eurocopter facility in France and was endorsed on AS 350 B3 in July 2010. He was well experienced with over 3950 hrs of flying experience which includes 181 hrs on AS 350 B3, of which 102 hrs were as PIC. The last proficiency check with a check pilot was carried out on 21st Feb 2011 and was cleared for Special VFR operations on 25th Jan 2011. The Pilot had good hill flying experience including the North East sector.

1.5.1 Pilot – in – Command

Name	:	CHPL holder
Age	:	43 Yrs 06 Months
Licence	:	CHPL
Date of Issue	:	19/05/2010
Valid up to	:	18/05/2015
Category	:	CHPL
Endorsements as PIC	:	AS 350 B3, Dauphin
Date of Med. Exam.	:	19 th Jan 2011
Med. Exam valid upto	:	18 th Jul 2011
FRTO Licence		
Date of issue	:	19/05/2010
Valid up to	:	18/05/2015
Total flying experience	:	4000 hours
Experience on type	:	181:00 hrs
Experience as PIC on type	:	110:00 hours
Last flown on type	:	29/04/2011
Total flying experience during last 180 days	:	198:35 Hrs
Total flying experience during last 90 days	:	110:55 Hrs
Total flying experience during last 30 days	:	67:10 Hrs
Total flying experience during last 07 Days	:	18:05 Hrs
Total flying experience during last 24 Hours	:	03:50 Hrs

1.5.2 Record of Accident / Incident

The pilot had no reported incident/ accident. The original Log Book and Licence were not made available to the Committee.

1.5.3 Co-Pilot

The Co-pilot was an ex Army Aviation officer. He received his initial flying training at Air Force Academy, Hyderabad. The Pilot joined Pawan Hans on 17th Jan 2005 and initially flew Bell 407 helicopters. The Pilot was trained at Eurocopter facility in France and was endorsed on AS 350 B3 in June 2010. He was well experienced with over 3200 hrs of flying experience which includes 225 hrs on AS 350 B3, of which 110 hrs were as PIC. The last proficiency check with a check pilot was carried out on 2nd Feb 2011 and was cleared for Special VFR operations on 13th Nov 2010. The Pilot had good hill flying experience including the North East sector.

Name	:	CHPL holder
Age	:	52 Yrs 03 Months
Licence	:	CHPL
Date of Issue	:	08/06/2008
Valid up to	:	07/06/2013
Category	:	CHPL
Endorsements as PIC	:	AS 350 B3
Date of Med. Exam.	:	31 st Dec 2010
Med. Exam valid upto	:	30 th Jun 2011
FRTO Licence		
Date of issue	:	08/06/2008
Valid up to	:	07/06/2013
Total flying experience	:	3200 hrs
Experience on type	:	225:00 hrs
Experience as PIC on type	:	110:00 hrs
Last flown on type	:	29/04/2011

Total flying experience during last 180 days	:	203:15hrs.
Total flying experience during last 90 days	:	99:25 hrs.
Total flying experience during last 30 days	:	51:30 Hrs.
Total flying experience during last 07 Days	:	18:05 Hrs.
Total flying experience during last 24 Hours	:	03:50 Hrs.

1.5.4 Record of Accident / Incident

The pilot had one reported incident of exceeding torque while taking off on Bell 407 helicopter at Katra Base on 29th Oct 2009. The original Log Book and Licence were not made available to the Committee.

1.5.5 Aircraft Maintenance Engineer

The AME who released the helicopter on 30th April 2011 was qualified and was endorsed on AS 350 B3 helicopters.

1.6 Aircraft Information

Ecureuil AS 350 B3 helicopter is a single engine helicopter fitted with Turbomeca Arriel 2B1 engine manufactured by Eurocopter France. The helicopter is certified in transport category, under VFR only. The helicopter has a service ceiling of 23,000 feet and the maximum All Up Weight of the helicopter is 4950 lbs.

1.6.1 Technical Details of the Helicopter

The Helicopter Model AS 350 B3 from Eurocopter France was imported by PHHL under NSOP in the year 2010. The helicopter, one among three was received at Palam and assembled as per erection schedule on 19th July 2010. The helicopter was test flown as per approved Test Flight Schedule and offered for issue of Certificate of Airworthiness.

Helicopter Regn. No	:	VT-PHT
The Helicopter Model	:	AS 350 B3
The Name of Manufacturer	:	Eurocopter, France
Helicopter Sl. No	:	4991
C of A (Date of issue)	:	21.07.2010 valid till 20.07.2015
C of R Date of issue	:	07.07.2010
Total Hrs Since New	:	360.00 as on 30. 04. 2011 before first flt
Last Major Schedule (100 Hrs inspection / 3 Monthly) carried out	}	At A/F Hrs 267:25 on 10.04.2011
Engine Make and Model		
Date of Manufacture	:	16.2.2010
Date of installation	:	March 2010
TSN	:	306.00
Last Inspection	:	100 Hrs along with A/F inspection
Repetitive snag(last 15 days)	:	Nil
Major Snags reported (last 30 days)	:	Nil

1.6.2 List of Avionics Items Fitted

ELT Make and Model	:	Kannad , Kannad 406 AF -H
Check on ELT	:	As per Pre flight ‘ To Arm’
ELT Battery status	:	Expiry on 09/2016
VHF Main	:	Garmin, GNS 430
VHF Stand-by	:	Bendix /King KX 165A
ADF	:	Honeywell(Bendix/King) KR 87
VOR	:	Garmin GNS 430

ILS system	:	Localiser Receiver Garmin GNS 430 Glidepath Receiver Garmin GNS 430 Marker Receiver Garmin GMA 340
ATC Transponder	:	Garmin GTX 327
Radio Altimeter	:	Thales AHV 16
GPS	:	Garmin GPS 430

1.6.3 Other Instruments

Compass

Altimeter

ASI

Chronometer

1.6.4 Scrutiny of Records

(a) As per records made available, except for minor snags on Hydraulics and Fuel filter pop out indication there was no snag reported during the last 30 hours of operation.

(b) On 15th April 2011, a portable Oxygen cylinder was kept at the back of the pilots seat and secured with a locally made belt. There was no authority for positioning the Oxygen bottle at that location. The statement obtained from the concerned AME reveals that this was done at the request of the pilot, as they had to fly at high altitude occasionally. The portable cylinder had two masks attached to it and could be used by both/ either pilots. For passengers, four inhaler pumps were kept. As per the statement of the A.M.E it was not uncommon that the passengers used this help when they felt uneasy/ suffocated. However, there is no laid down procedure for use of oxygen by the crew.

(c) Engine Power Checks were carried out on 8th April, 17th April and 26th April 2011. All checks showed enough T4 margin and positive Tq margin. The helicopter

has flown every day from 14th April to 22nd April 2011 with same operating crew combination.

(d) Maintenance base at Itanagar was approved for inspections up to 100 Hrs for MI 172 and Dauphin helicopter only as per CAR 145. Approval for maintenance of AS 350 B3 at Itanagar has not been obtained. However, Guwahati base has been approved for carrying out 100 Hrs/ 03 months inspection of AS 350 B3 helicopter and its engines. The last 100 Hrs inspection of the helicopter was carried out at Guwahati on 10th April 2011. There was no deficiency recorded.

(e) The scrutiny of schedule revealed that some special tools (for example, a spring balance) were listed which according to the A.M.E is wrongly entered. This indicates lack of monitoring and application of mind by engineers at Managerial position and in Quality Control division.

(f) Interactions with the A.M.Es at Guwahati revealed that they have to refer to the MET (Task Cards) and S.Bs to comply with the schedule. Such documents should be available along with the procedure sheet to avoid looking for them at various folders and overlooking them when needed.

1.6.5 Load and Trim Sheet

The load and trim sheet for the sortie was not available on ground as the ground agency was not in possession of the same. There was no practice by PHHL to keep a copy of the load and trim sheet at the transit station, as specified in the CAR. The load and trim sheet may have been calculated and kept in the journey log book (JLB). The JLB has got burnt and got destroyed during the crash. However, it appears that the pilots could not calculate the load and trim sheet due to paucity of time. Based on the available records and eyewitness statements, the helicopter was initially overloaded and one passenger and some luggage was offloaded after the initial pick up. Thereafter the load and trim was within limits and the pilots carried out a take off.

1.7 Meteorological Information

The weather at departure from Tawang was – Surface Winds 200° / 05 knots, visibility 6000 meters, Clouds- Few at 2000 feet, Few at 10000 feet and temperature of 18.8° Centigrade. Sela Pass was partially visible and Bhutan valley was clear. The pilots had obtained telephonic briefing of weather prior to take off from Itanagar. However, they have not requisitioned for a written brief (as reported by Met Itanagar) and hence were not in possession of the synoptic situation, satellite picture, TAFs, upper wind charts and other significant weather data. The present weather at Tawang was passed to the pilots at start up. At Tawang, the pilots did not ask for enroute and destination weather and the same was not briefed to them either.

1.7.1 Met Reports: Itanagar

Time : 0000 UTC
Wind : Calm
Visibility : 2 Km
Clouds : 3 Okta Sc/ Cu/ AC
Temp : 19.4°C
Dew Point : 18.1°C
Trend : Possibility of rain/ thunder showers.

Time : 0300 UTC
Wind : North Easterly / 04 Kmph
Visibility : 2 Km
Clouds : 01 Okta Sc/ Cu
Temp : 28.4°C
Dew Point : 23.1°C
Trend : Possibility of rain/ thunder showers.

Time : 0600 UTC
Wind : North Easterly / 04 Kmph
Visibility : 2 Km
Clouds : 07 Okta, St / Sc/ Ac
Temp : 30.6°C
Dew Point : 21.7°C
Trend : Possibility of rain/ thunder showers.

Time : 0900 UTC
Wind : North Easterly / 04 Kmph
Visibility : 2 Km
Clouds : 06 Okta St/ Sc/ Ac
Temp : 29.4°C
Dew Point : 23.3°C
Trend : Possibility of rain/ thunder showers.

Time : 1200 UTC
Wind : North Easterly / 04 Kmph
Visibility : 2 Km
Clouds : 01 Okta Sc / Cu/ Ac /Ci
Temp : 29.8°C
Dew Point : 23.7°C
Trend : Possibility of rain/ thunder showers.

1.7.2 Met Report Tawang

Time : 0000 UTC

Wind : Calm

Visibility : 6 Km

Clouds : 01 Sc 010, 02 Sc 020, 04 Ac 080

Temp : 08°C

QNH : 1022.5

Approaches : Sela Pass Partially Visible, Bhutan Valley Clear

Time : 0300 UTC

Wind : 200° / 05 Kts

Visibility : 6 Km

Clouds : 02 Sc 020, 01 Ac 100

Temp : 14.2°C

QNH : 1022

Approaches : Sela Pass Partially Visible, Bhutan Valley Clear

Time : 0400 UTC

Wind : 200° / 05 Kts

Visibility : 6 Km

Clouds : 02 Sc 020, 01 Ac 100

Temp : 17.4°C

QNH : 1023

Approaches: Sela Pass Partially Visible, Bhutan Valley Clear

Time : 0500 UTC

Wind : 270 / 05 Kts

Visibility : 6 Km

Clouds : 01 Sc 015, 02 Sc 020
Temp : 18.8°C
QNH : 1023
Approaches : Sela Pass Partially Visible, Bhutan Valley Clear.

Time : 0600 UTC
Wind : 220 / 10 Kts
Visibility : 6 Km
Clouds : 02 Sc 015, 01 Cu 020, 03 Sc 020, 01 Ci 250.
Temp : 18.4°C
QNH : 1022
Approaches : Sela Pass Partially Visible, Bhutan Valley Clear.

Time : 0700 UTC
Wind : 260 / 10 Kts
Visibility : 6 Km
Clouds : 02 Sc 015, 04 Sc 020, 01 TCu (N & SE 20 Km) 020,
02 Ci 250
Temp : 18.0°C
QNH : 1021
Approaches : Sela Pass Not Visible, Bhutan Valley Partially Clear.

Time : 0900 UTC
Wind : 290 / 10 Kts
Visibility : 6 Km
Clouds : 03 Sc 015, 04 Sc 020, 01 T Cu 020 (S & SE), 03 Ci 250
Temp : 17.0°C

QNH : 1023
Approaches : Sela Pass Not Visible, Bhutan Valley Partially Clear.

Time : 1200 UTC
Wind : 290 / 05 Kts
Visibility : 6 Km
Clouds : 03 Sc 015, 03 Sc 020, 01 TCu 020 (S 10 Km), 03 Ci 250
Temp : 12.4°C
QNH : 1022
Approaches : Sela Pass Not Visible, Bhutan Valley Partially Clear.

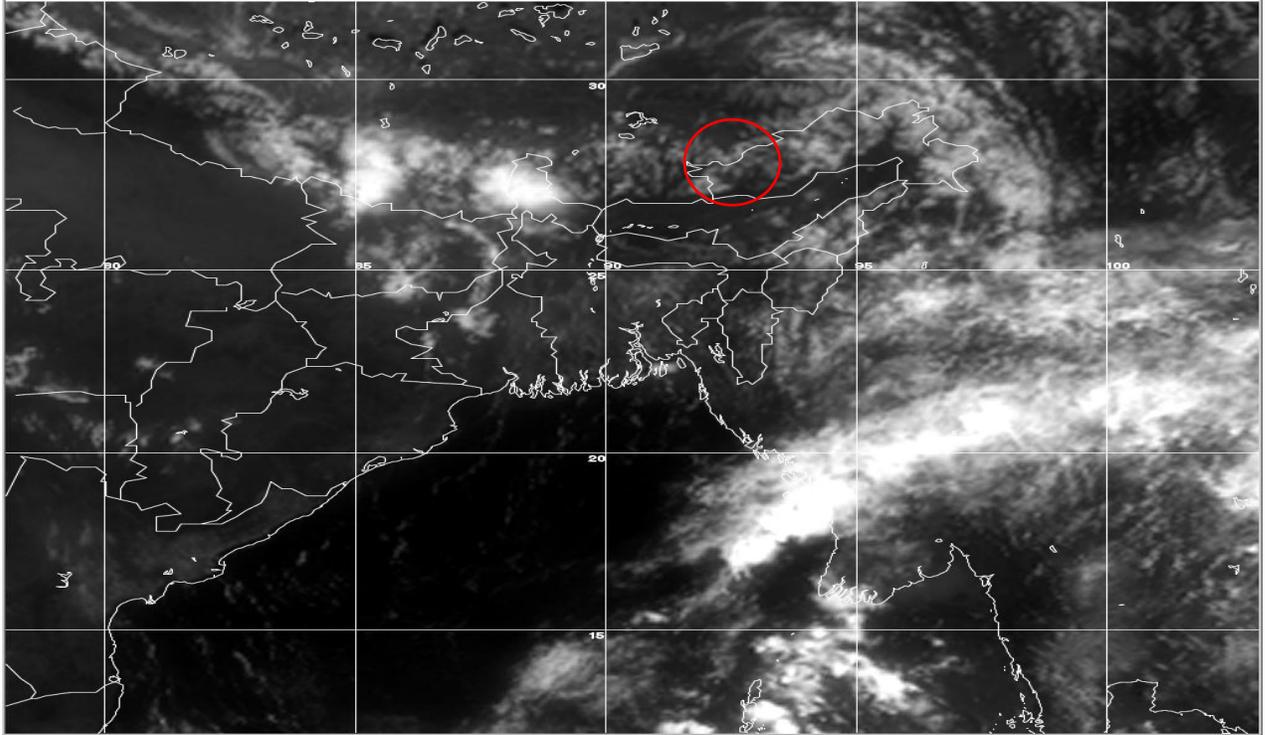
1.7.3 Weather Forecast Guwahati

Time : 0300 UTC

The forecast weather at Guwahati for 30th April 2011 was partly cloudy sky, with development of thunder clouds towards evening/ night. Maximum temperature was expected to be around 33°C. The outlook for the next two days indicated little change.



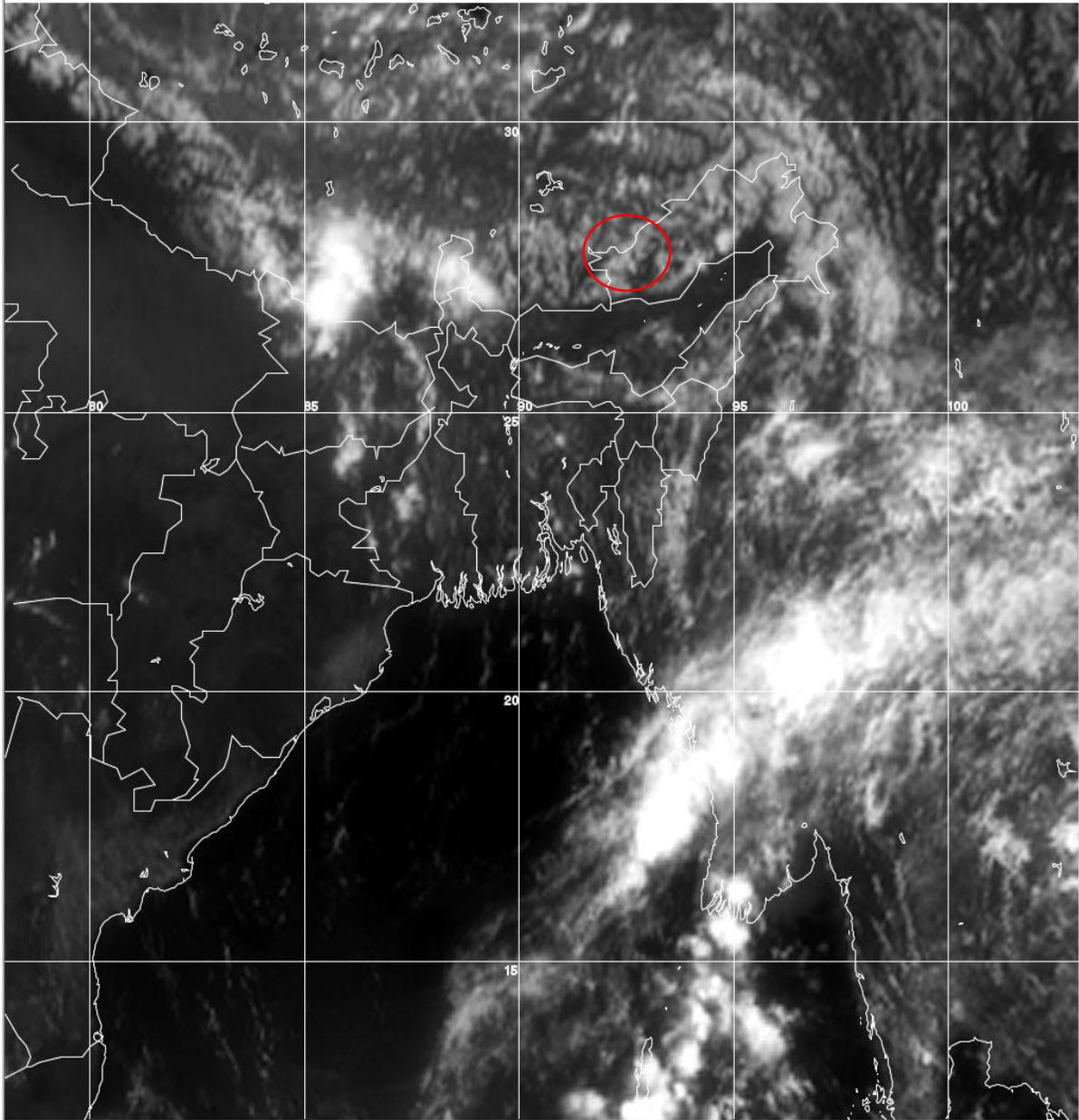
VIS Linear Stretch 1.0%



SATELLITE PICTURE 30th APRIL 2011 AT 0330 UTC



VIS Linear Stretch 1.0%



SATELLITE PICTURE 30th APRIL 2011 AT 0500 UTC

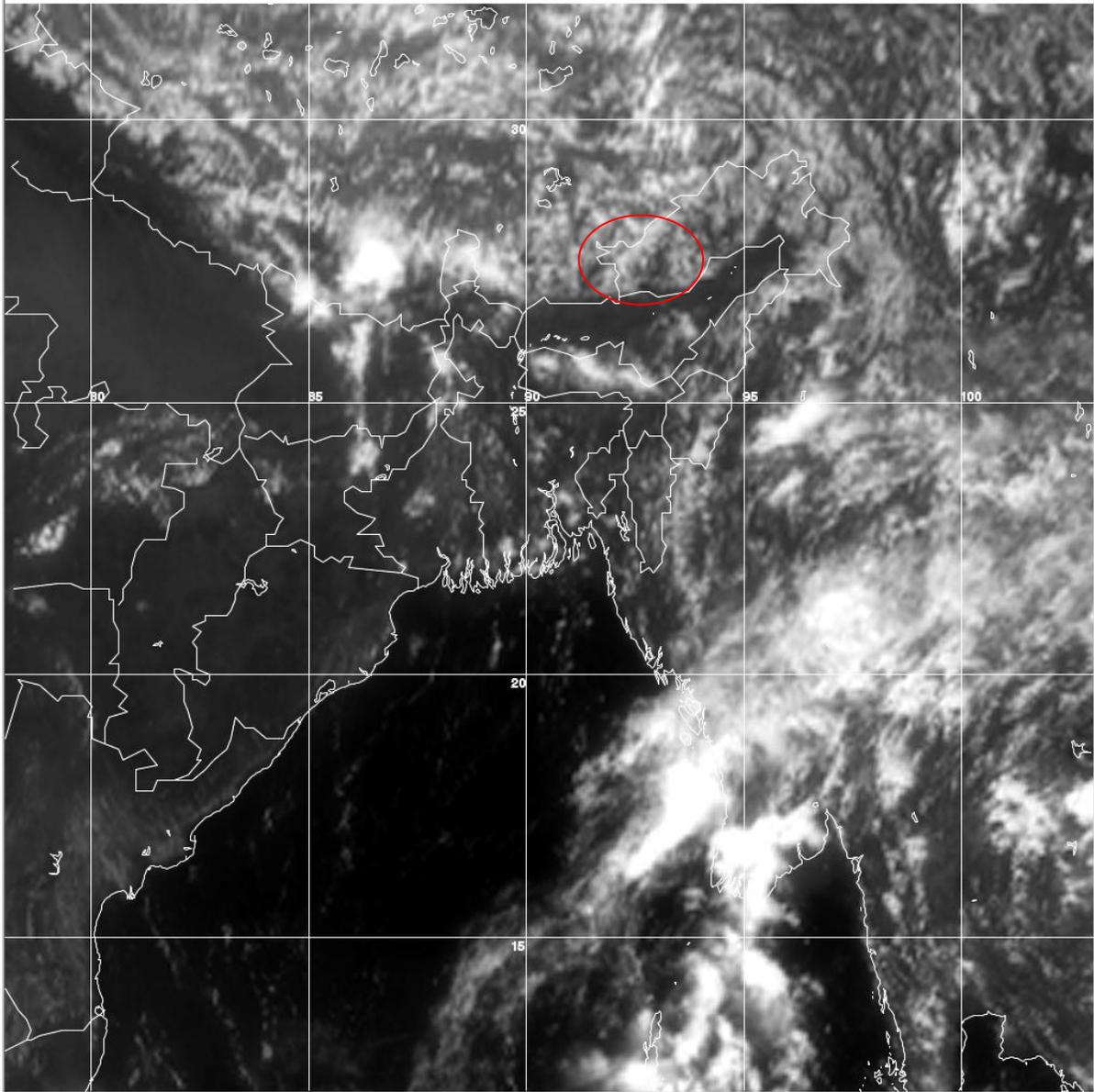
Projection : MER
NEQ_VIS

30-04-2011 / 06:30Z

Sat: KALPANA-1



VIS Linear Stretch 1.0%



SATELLITE PICTURE 30th APRIL 2011 AT 0630 UTC

1.7.4 Analysis of Weather

Synoptic Situation

A cyclonic circulation lay over South Bangladesh and neighborhood extending upto 0.9 Km. Under the effect of this system, light rain/ thundershowers were expected over Arunachal Pradesh, Assam, Meghalaya, Nagaland, Manipur, Mizoram and Tripura. Broken low and medium clouds with embedded weak to moderate convection was observed over Central Arunachal Pradesh. Scattered low medium clouds were reported over the rest of the state. A marked increase in the day temperatures were observed over Arunachal Pradesh. 6 mm of rainfall occurred over Bomdila and 17 mm over Tawang on the 30th April 2011. The hills of Arunachal Pradesh have limited weather forecast coverage, with only Itanagar, Tawang and Bomdila having limited observation facilities.

Analysis of Weather in Tawang Sector

The weather in North East India changes rapidly especially in the pre-monsoon and the monsoon periods. This is more prominent in the hilly regions where local phenomenon like moisture incursion and rise in temperatures may cause sudden and unpredicted changes in weather. Flying in the hills is generally not carried due to turbulence and chances of deterioration in weather. On the fateful day also, the weather over the Sela pass region had been reported as partially clear since sunrise till 0600 UTC. Thereafter Sela Pass was reported as not clear.

Eyewitness Account

As per the eyewitness, the surrounding hill tops and tops of the ridges were all covered. The Communication sets of the Army post at Baisakhi, near Sela pass in Arunachal Pradesh, was switched off at 0500 UTC due to thundershowers and associated lightening. The pilots too reported a break in the clouding when over the

Sela pass, which indicates that there was considerable amount of clouding in the area.



WEATHER TOWARDS BHUTAN VALLEY AS OBSERVED FROM TAWANG HELIPAD AT 0430 HOURS ON 30th APRIL 2011



VIEW OF WEATHER TOWARDS SELA PASS AS OBSERVED FROM TAWANG HELIPAD AT 0430 HOURS ON 30th APRIL 2011



**WEATHER TOWARDS BHUTAN VALLEY AS OBSERVED FROM
TAWANG HELIPAD AT 0530 HOURS ON 30th APRIL 2011**



**VEIW OF WEATHER TOWARDS SELA PASS AS OBSERVED FROM
TAWANG HELIPAD AT 0530 HOURS ON 30th APRIL 2011**

1.8 Aids to Navigation

The helicopter is only VFR cleared and is equipped with ADF, VOR, DME, ILS, ATC Transponder, GPS and an ELT. However, these aids (other than GPS) could not be utilized due to the hilly terrain and the helipad at Tawang not being equipped with any ground navigational equipment to support the airborne equipment.

1.9 Communications

The helicopter has a main and standby VHF communication set which has limited ranges in the hills due to being a Line of sight communication equipment. The IAF maintains a permanent detachment at Tawang which is equipped with a LUP (VHF radio) set. A manual log of the communications is maintained by the ATC personnel at Tawang detachment. The communication between the Air Traffic Controller at Tawang and the helicopter VTPHT is as attached.

ATCs Record of Communication

Time	ATC	VHT	RT Conversation
0950	-	VHT	Tango control VHT start up
	ATC	-	VHT Tango control start up approved surface wind 200/05 kts, Visibility 6 Kms fair, Few 020, Few 100, 02 Octa, Temp 18 decimal 8, QNH 1023, Sela pass partially visual
0956	-	VHT	Tango control VHT take off
	ATC	-	VHT Tango control surface wind 200/ 05 kts clear for take off
0958	ATC	-	VHT Tango control standing by for POB and estimates
	-	VHT	Tango control VHT POB 2+3 ETA 0535

1006	ATC	-	VHT Tango control 2+3 ETA Itanagar 0535 copied. Give a call exiting Sela.
	ATC	-	VHT Tango control check position
	-	VHT	Tango control VHT overhead Sela
	ATC	-	VHT Tango control request enroute and weather at Sela
	-	VHT	Sela is partially clear and break through is there
1010	ATC	-	VHT Tango control, Sela is partially clear and break through is there. Copied. Give a call clear of Sela.
	ATC	-	VHT Tango control check position
	-	VHT	Tango control VHT 15 miles clear of Sela.
	ATC	-	VHT Tango control copied 15 miles, clear of Sela. Clear change over to valley frequency Jai Hind.
	-	VHT	Roger

1.10 Aerodrome Information

Tawang town has three helipads. These are the Tawang civil helipad, the Army helipad and a helipad at Khirmu. Limited ATC and Met facilities are available only at Tawang Army helipad. Only VFR operations are permitted in the hills. There are no navigational aids at any of these helipads. The helipads, thus meet the specifications of temporary helipad only. PHHL carries out regular operations to

Tawang civil helipad with a helicopter service on six days a week. The helipad should have thus met the requirements of a regular helipad.

1.11 Diversionary Helipads

In addition to the three helipads at Tawang, a prepared but unmanned helipad also exists about approximately 6 Km from the crash site.

1.12 Search and Rescue Services

The Search and Rescue Services in India are organized in accordance with ICAO Annexure 12 by the Airports Authority of India in collaboration with the Ministry of Defence, which has the responsibility for making the necessary resources available. Control of the Rescue will be through the Rescue Coordination Centre (RCC) of the respective FIR. The Flight Information Centres discharge the duties of RCCs for their FIRs in addition to their other functions. The RCC responsible for SAR in this accident was the Guwahati FIC.

1.12.1 Head of SAR Services Guwahati

The General Manager (Aerodromes) Airports Authority of India, Guwahati Airport is the head of the Search and Rescue Services of North eastern Region

1.12.2 Agencies Involved in SAR Operations

Various other departments of the Central and State Governments viz. Railways, P&T, All India Radio, Police and District Collectors/Magistrates etc., Municipal and Local Bodies, Airline Operators, Flying Clubs, Professional Pilots, Mercantile Marine, Port Trusts and Armed Forces are available for Search and Rescue missions as and when required.

1.12.3 Delimitation of the Area of Responsibility

The SAR area of Guwahati Search and Rescue Region is the area contained within the boundaries of Guwahati Flight Information Region. Guwahati Flight Information Region begins at the intersection of 88⁰⁰'E meridian with the common border of India / Nepal border and then along the Tibet / India border to 28⁰⁵⁰'N 96⁰³⁴'E to 21⁰⁵⁷'N 92⁰³²'E, then along common India / Bangladesh border to the intersection of 26⁰⁰⁰'N Lat to 26⁰⁰⁰'N 88⁰⁰⁰'E to the common border of India / Nepal at the intersection of 88⁰⁰⁰'E meridian.

1.12.4 RCC Guwahati – Functions

RCC Guwahati is responsible for promoting efficient organisation of SAR Services and co-ordinating conduct of SAR operations within Guwahati SRR. RCC is responsible for drawing up a detailed plan for the conduct of SAR in its area, which include –

- (a) Organisation of the quickest possible means of communication in the area and with adjacent areas, for exchange of search and rescue information
- (b) Organisation of rescue units and designation of alerting posts
- (c) Coordination with services and organizations likely to be useful
- (d) Responsibilities of personnel assigned to search and rescue
- (e) Location, call signs, hours of watch and frequencies of radio stations maintaining watch for the purposes
- (f) Manner in which search and rescue is to be conducted
- (g) Actions planned jointly with adjacent Rescue Coordination Centers
- (h) Any special provisions necessary or incidental to the conduct of SAR.

1.12.5 Information Regarding State of Emergency of an Aircraft

An ATS Unit may generally become aware that an aircraft is in a state of emergency in one or more of the following ways:

- (a) Report to that effect by the aircraft itself.
- (b) Failure of an aircraft to report position or to respond to calls either from the ground or from other aircraft.
- (c) Failure to appear on radar when normally it should have appeared or sudden disappearance from radar screen.
- (d) Emergency indications on ADS and Secondary Surveillance Radar (SSR).
The following SSR Code will be applicable relating to the nature of an emergency as below:
State of Emergency: Mode A Code 7700
Two-way communication lost: Mode A Code 7600
Unlawful interference: Mode A Code 7500
- (e) Reports by Pilots of other aircraft or ships at sea.
- (f) Reports from Airline Operators who may have received the information on their Company channels.
- (g) Reports from members of public.
- (h) Alert messages received via Satellites relayed by IMCC.

1.12.6 Declaration of Emergency

Notification of emergency: Without prejudice to any other circumstance that may render such notification advisable, ATS Units shall notify RCC Guwahati immediately, that an aircraft is considered to be in a state of emergency.

1.12.7 Phases of Emergency

(a) Uncertainty Phase

- (i) When no communication has been received from an aircraft within a period of 30 minutes after the time, a communication should have been received or from the time an unsuccessful attempt to establish communication with such aircraft was first made, whichever is earlier or when

(ii) An aircraft fails to arrive within 30 minutes of the estimated time of arrival last notified to or estimated by Air Traffic Services Unit, whichever is the later except when no doubt exists as to the safety of the aircraft and its occupants.

(b) Alert Phase

(i) Following the uncertainty phase, subsequent attempts to establish communication with the aircraft or enquiries to other relevant sources have failed to reveal any news of the aircraft, or when

(ii) An aircraft has been cleared to land and fails to land within five minutes of the estimated time of landing and communication has not been re-established with the aircraft' or when

(iii) An aircraft is known or believed to be the subject of unlawful interference.

(c) Distress Phase

Following the alert phase further unsuccessful attempts to establish communication with the aircraft and more widespread unsuccessful enquiries point to the probability that the aircraft is in distress.

1.12.8 Initiation of Action

On receiving information that an aircraft is in a state of emergency, the FIC Coordinator should initiate action immediately.

1.12.9 Aircraft Whose Position is Unknown

In the event that an emergency phase is declared in respect of an aircraft whose position is unknown the following will apply:

If RCC Guwahati is notified of an emergency phase and it is unaware of other centers taking appropriate action, RCC Guwahati will assume responsibility for

initiation of suitable action in accordance with these procedures and confer with neighboring RCCs to designate an RCC to assume responsibility in this regard.

1.12.10 Actions during Emergency Phase

Actions to be taken when aircraft enters into uncertainty phase:

- (i) The flight of the aircraft involved shall be plotted on a chart by FIC in order to determine the probable future positions of the aircraft at its maximum range of action from its last known position. The flight of the aircraft known to be in the vicinity of the aircraft involved should also be plotted to determine the maximum endurance.
- (ii) When FIC decides that an aircraft is in a state of emergency, it shall, as soon as possible inform other aircraft known to be in the vicinity of the aircraft involved, the nature of the emergency. At the discretion of the RCC other SAR units and RCCs may be alerted.

1.12.11 Alert Phase

SAR action is normally initiated when the state of emergency enters the Alert Phase. The GM (Aero) besides informing all concerned at his discretion will keep the Chairman, AAI (NAD), New Delhi informed through Member (O) and ED (ATM).

- (i) Send ALERFA message to concerned neighboring FICs, destination, alternate and other Aerodromes on the route where the aircraft could have landed.
- (ii) Plot the progress of the flight in Guwahati FIR, its point of entry, route followed, last position known or reported for further action.
- (iii) If the overdue aircraft is over the land, informs the Duty Officer, IAF, Guwahati to relay message to Air Officer Commanding to keep the search aircraft on standby.

(iv) Maintain watch on frequencies on which the aircraft was last working and do blind weather broadcast for the destination and alternate aerodromes, if the weather condition at Guwahati is below minima, if the destination of the involved aircraft is Guwahati.

(v) Inform Met Officer to send to FIC in plain language route forecast etc., for the route involved up to destination and alternate aerodromes.

1.13 Flight Recorders

CVR: The helicopter was not fitted with a CVR. It is not mandatory for helicopters with All Up Weight below 5700 Kgs to be fitted with a CVR.

DFDR: The helicopter was not fitted with a DFDR. It is not mandatory for helicopters with All Up Weight below 5700 Kgs to be fitted with a DFDR.

ECU: The helicopter is fitted with a FADEC. An electronic Engine control unit (ECU) continuously records the engine parameters and notes any parameters that have exceeded the tolerance limits. The ECU was recovered in a burnt and damaged condition from the crash site. No information was retrievable from the ECU at the BAE factory in France.

1.14 Wreckage and Impact Information

The accident site is approximately 6 Km from the nearest inhabited place Lubuthang Village. The site coordinates are 27⁰34'05N & 92⁰12'03E. The accident site is on the slope of a rocky spur. The debris of the helicopter was located at an altitude of 4600 Metres and is approximately 25 to 30 Km from the nearest road head. To reach the crash site a trek of approximately 14 to 16 hours is required. To attempt a ground recce of the site, an acclimatization period of minimum 10 days at

altitudes above 10,000 feet would be required. Considering the availability of time, the inhospitable and hostile terrain and the impending monsoons, it was decided that an aerial recce would be carried out by the committee members, which also could not be achieved due to inclement weather. The photographs taken of the crash site were utilized to obtain limited information. The committee members also spoke to various eyewitnesses who had been to the crash site. The helicopter has impacted on the ridge, North East of Sela pass. The helicopter has broken on impact, fallen to a place of relatively lesser gradient and then caught fire. The bodies of the two pilots and one passenger were charred. The bodies of the CM and the other passenger were separated from the main wreckage area on impact and were not affected by the fire after the impact.



PHOTOGRAPH SHOWING THE TERRAIN AND CRASH SITE



RIDGE WHERE THE HELICOPTER IMPACTED



HELICOPTER DEBRIS AT THE CRASH SITE





HELICOPTER DEBRIS

The wreckage was mainly concentrated at one point. The helicopter after having impacted at a point about 100 to 150 feet below the top of the ridge has fallen along the steep face of the cliff and rested at a place of relatively lesser gradient approximately 600 feet below. The helicopter has thereafter caught fire due to the availability of almost full fuel. The burn marks indicate the spread of fire in the rocky terrain. The fuselage has broken into a number of small pieces and most of it has burnt to ashes. The engine and a few other components were recovered from the crash site and was sent for further examination at the OEM site in France. The ECU was found in a burnt and damaged condition. The control columns were found

partially damaged due to the impact and post impact fire. All electronic equipment and instruments were found damaged due to impact or burnt in the post impact fire.

1.15 Fuselage

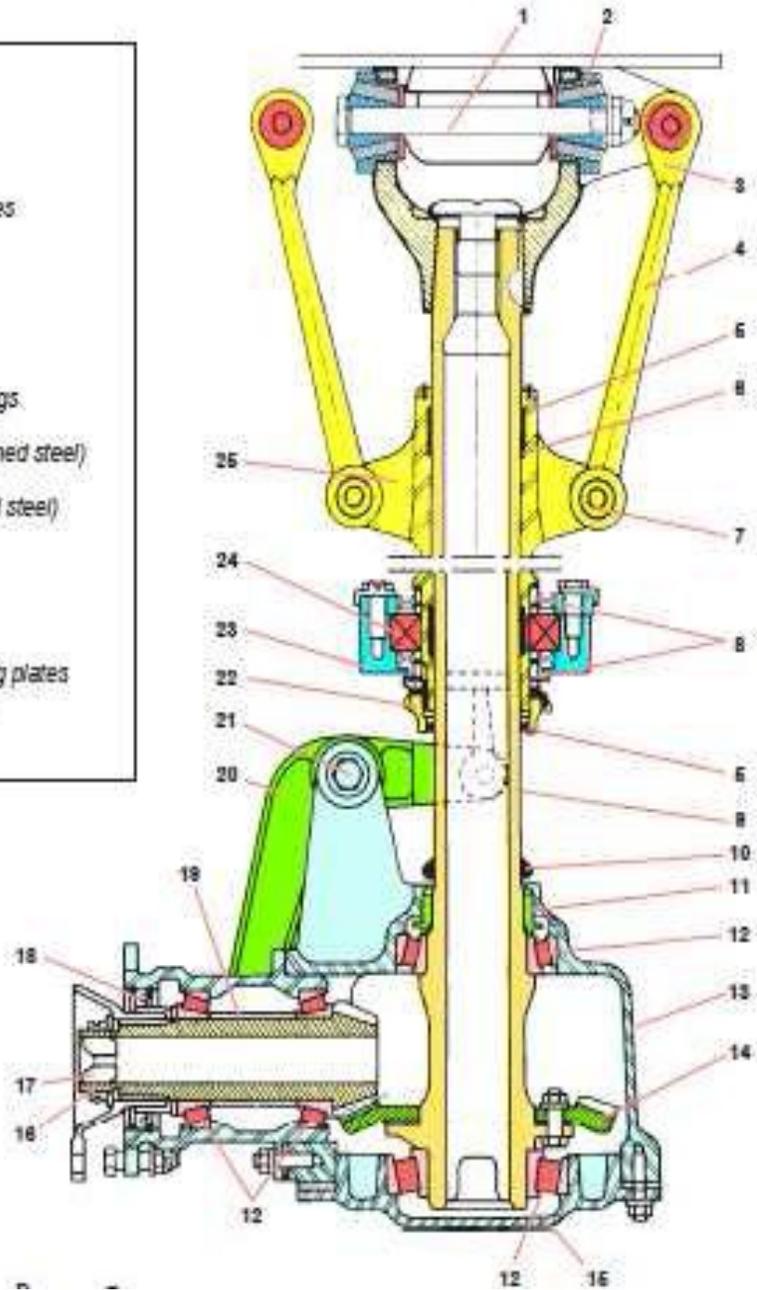
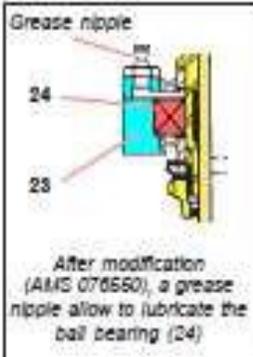
Except some small parts of the helicopter scattered around the main point of impact the majority of wreckage is located in a concentrated area which is relevant with an impact with a high energy. The main rotor blades exhibit significant mechanical and thermal damages resulting from the crash sequence and post-crash fire. Due to the difficulties to reach the crash site, only limited Air Frame components have been recovered. These include the Tail Rotor assembly, the recovered parts of the MGB to Engine coupling and the Engine to Tail Rotor Drive Shaft coupling.

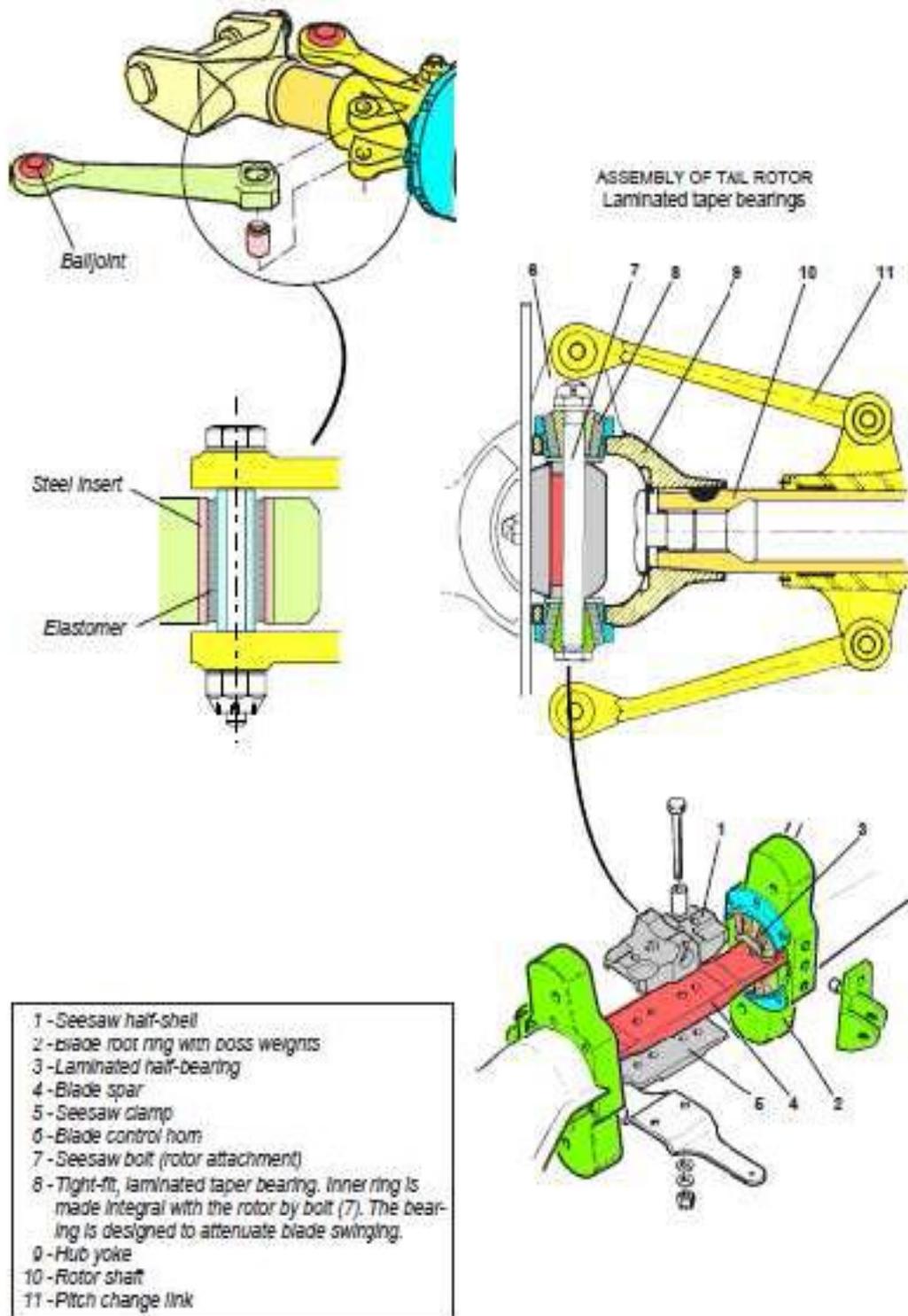
1.15.1 Tail Rotor Assembly

The Tail Gearbox to Air Frame attachments exhibit thermal and mechanical damages. The pitch change bellcrank is still connected to the casing and partially melted. One of the pitch change link is bent and exhibits thermal damage resulting from the crash. All the elastomeric parts are melted. The post crash fire has significantly damaged the tail rotor blade assembly. One of the tail rotor gearbox input flange arms is broken (overload failure resulting from the crash), the flexible coupling is in good condition. The tail rotor gearbox turns freely. No particle was observed at the magnetic plug. The pitch change spider ball bearing is thermal affected but turns freely. The coupling woodruff key between the tail rotor hub and the tail rotor gearbox output shaft shows evidence of a light bending (beginning of shearing) in the inertia side.

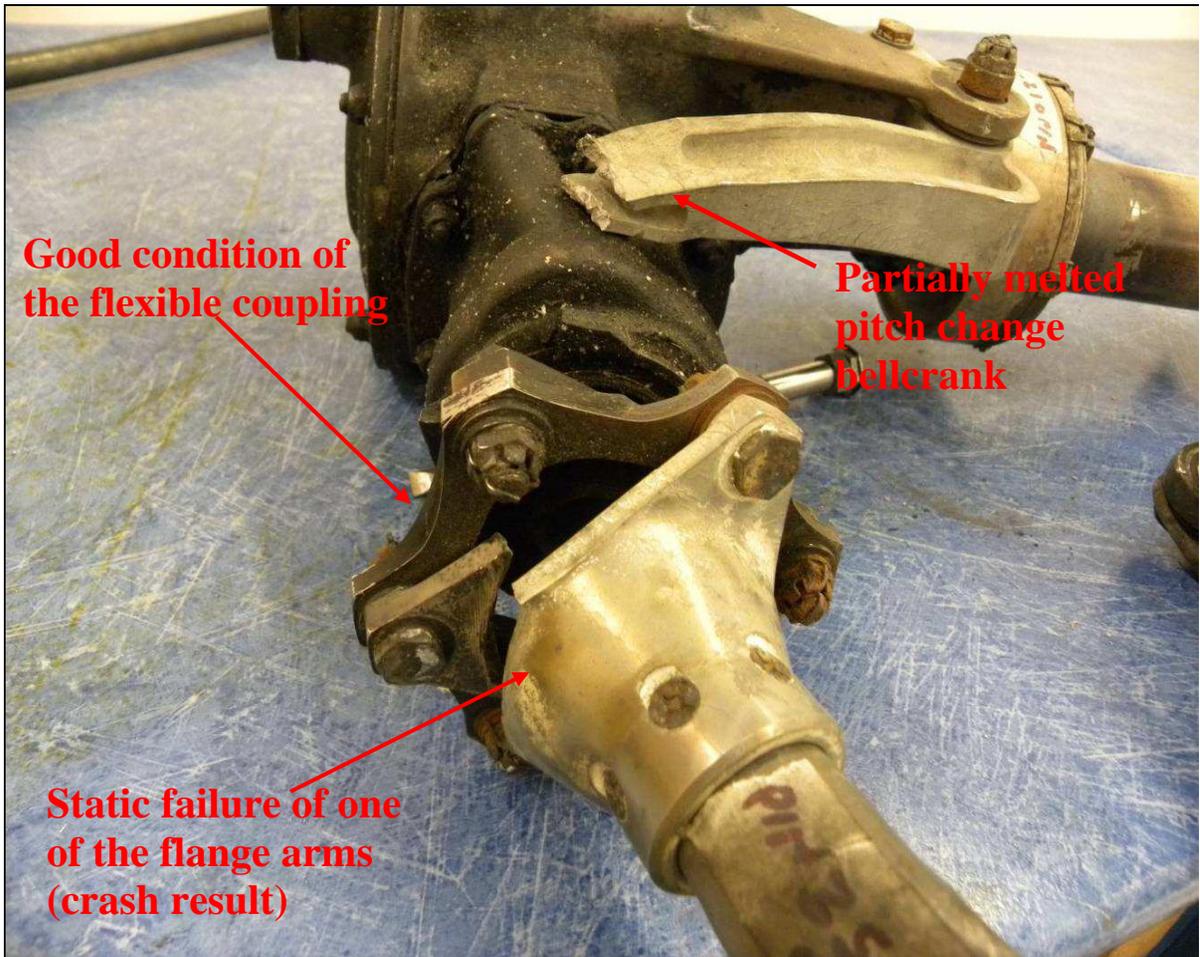
Tail Rotor Assembly Design Details

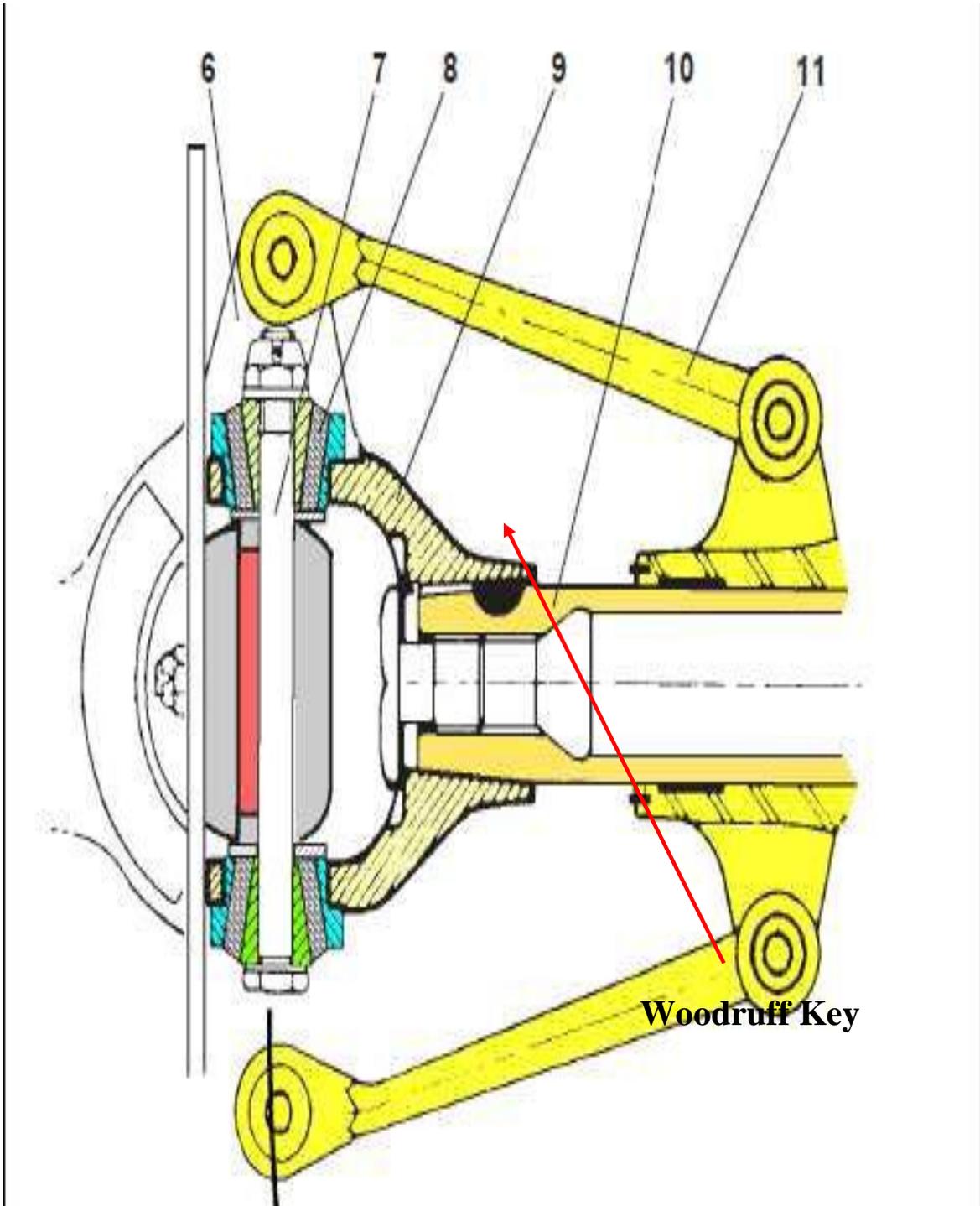
- 1 - Rotor mounting bolt
- 2 - Hub
- 3 - Self-lubricating balljoint
- 4 - Pitch change link
- 5 - Dust protector wiper seals
- 6 - Self-lubricating friction bushes
- 7 - Hinge on shock mounts
- 8 - Bearing protective baffles (grease-filled)
- 9 - Rotor shaft (steel)
- 10 - V-ring dust protector
- 11 - Threaded baffle joint
- 12 - Timken tapered roller bearings
- 13 - TGB casing
- 14 - Bevel ring gear (case-hardened steel)
- 15 - TGB cover (light alloy)
- 16 - Bevel pinion (case-hardened steel)
- 17 - Vented plug
- 18 - Magnetic seal
- 19 - Bearing spacer
- 20 - Pitch change bellcrank
- 21 - Expansible bolt
- 22 - Nut joining stationary/rotating plates
- 23 - Stationary plate (light alloy)
- 24 - Deep groove ball bearing
- 25 - Rotating plate (light alloy)





Tail Rotor Assembly Design Details





Tail Rotor Hub To Gearbox Shaft Coupling Woodruff Key

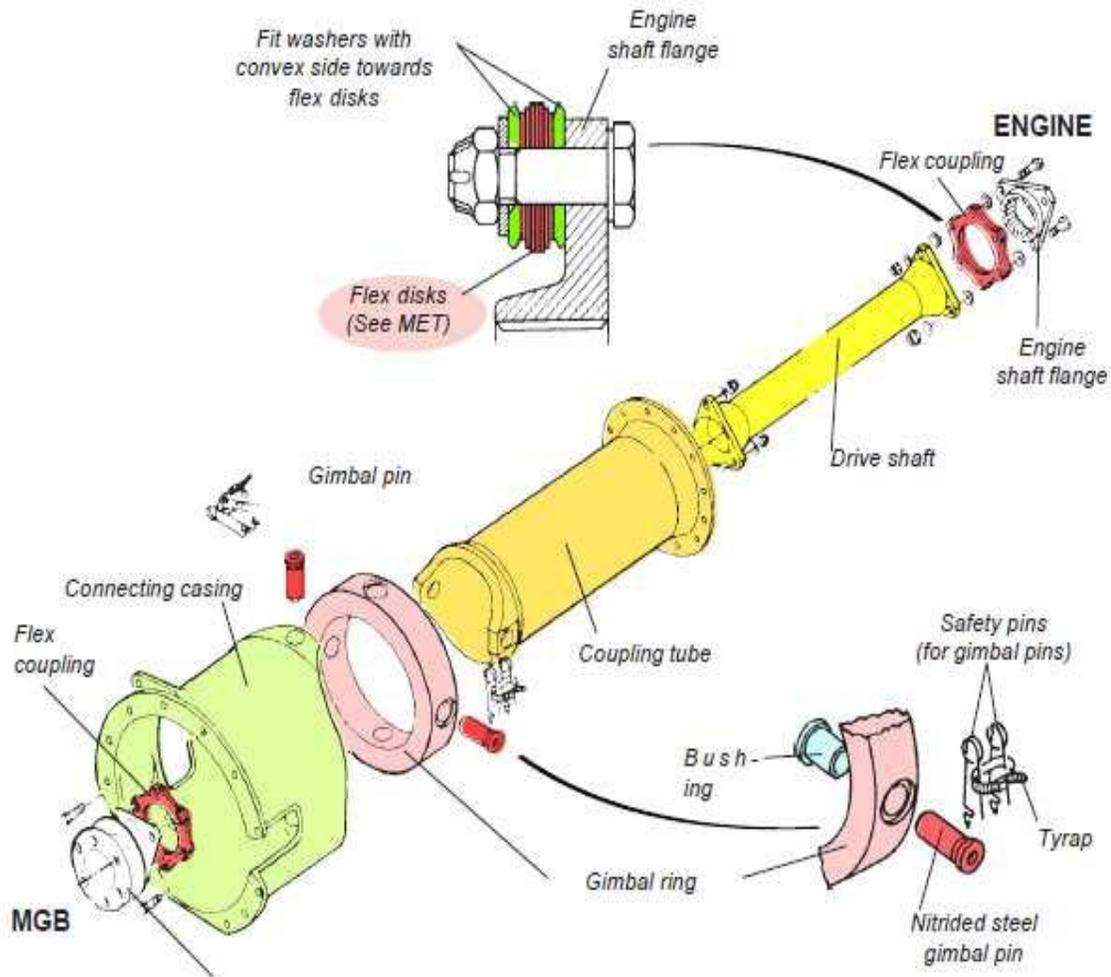


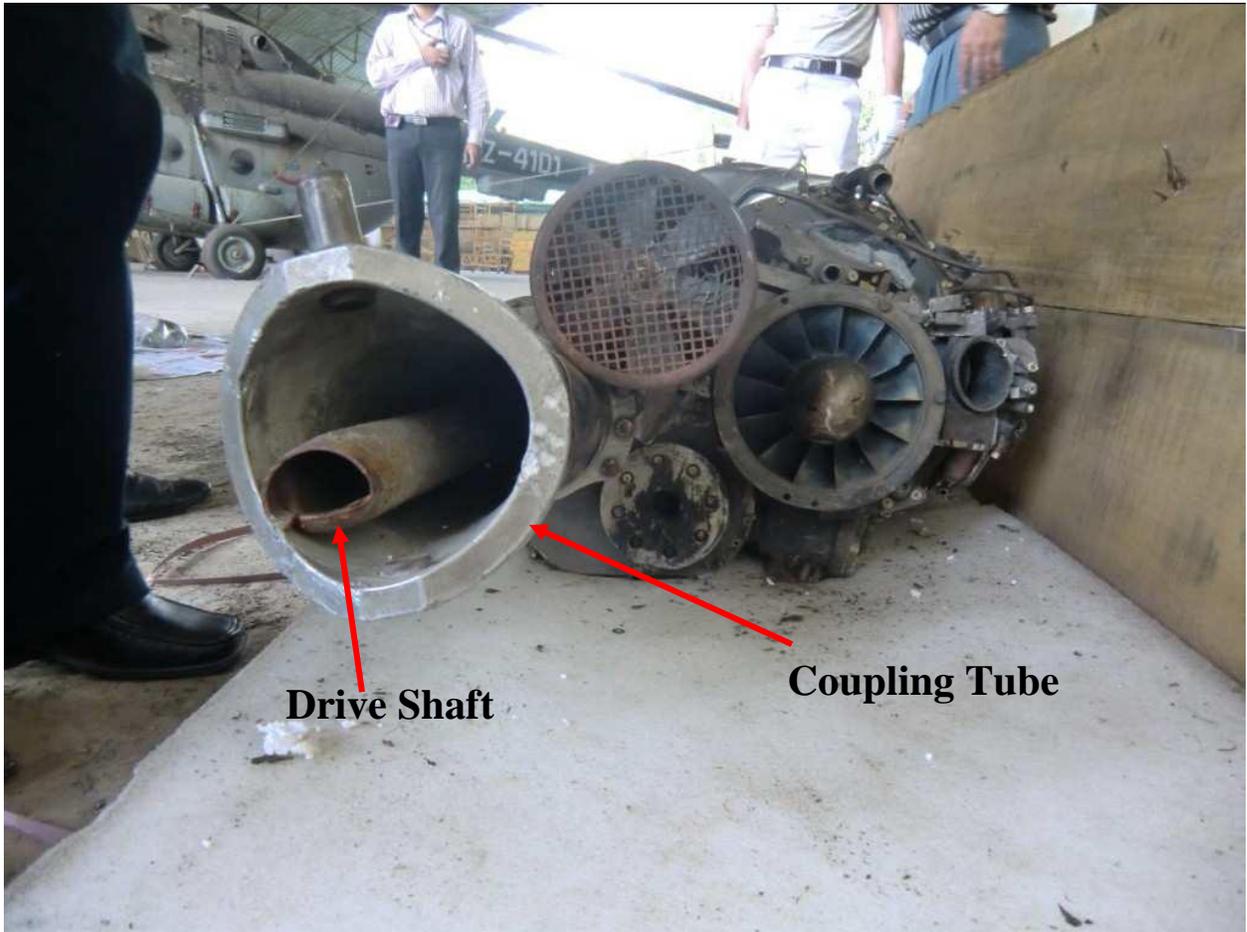
Tail Rotor Hub to Gearbox Shaft Coupling Woodruff Key
Beginning of Shearing in the Direction of the Arrow (inertia direction)



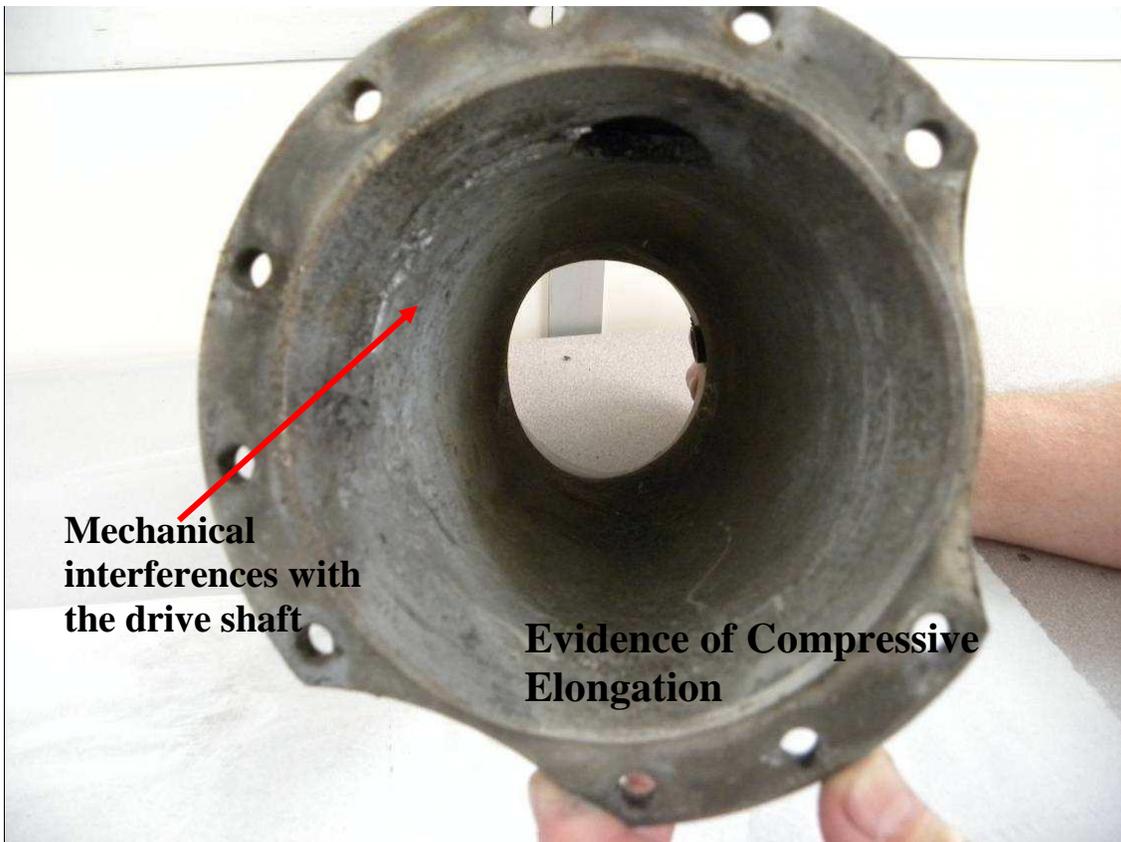
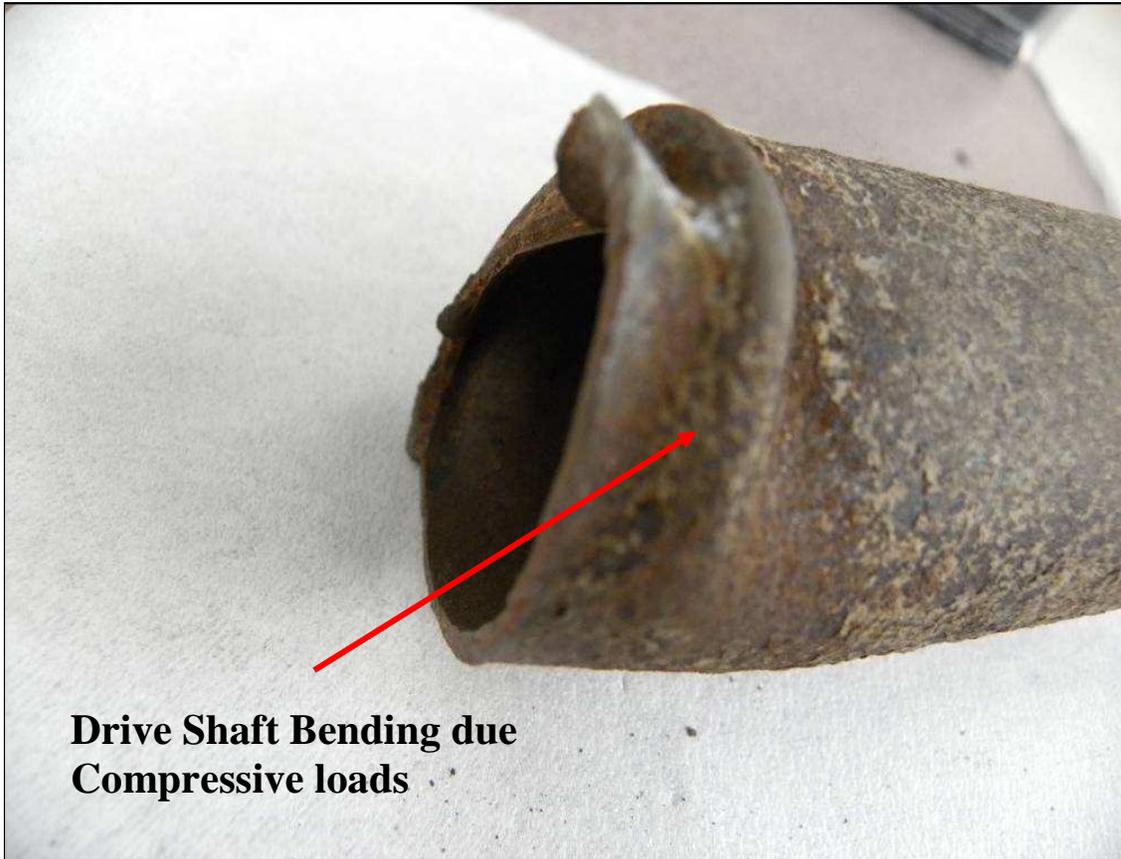
The examination of the recovered part of the tail rotor assembly does not indicate any evidence of any pre-crash failure. All the damages observed are the consequence of the crash and post-crash fire. The coupling woodruff key evidences a beginning of shearing in the inertia side (direction of a sudden stoppage of the Main Rotor Head).

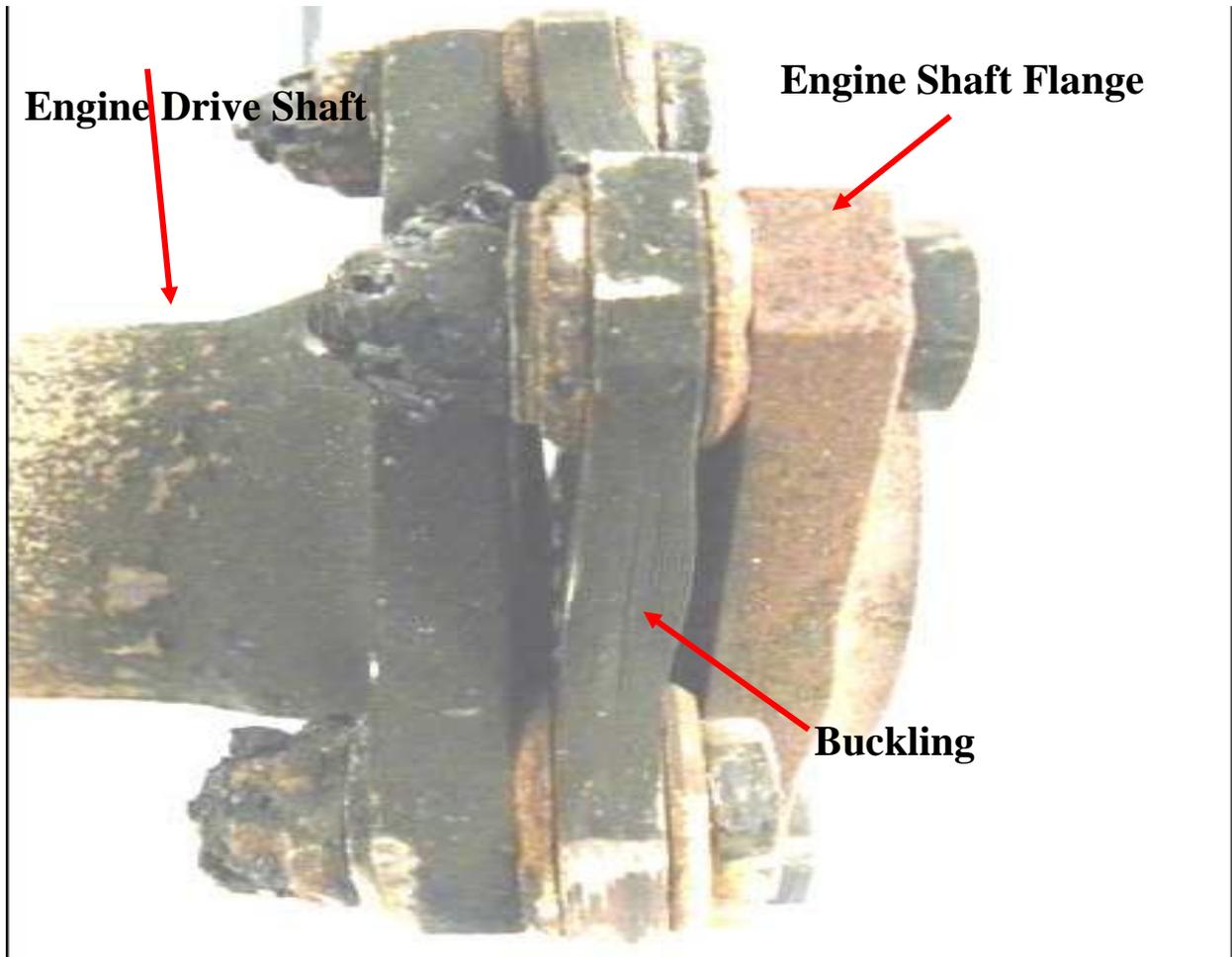
1.15.2 Engine To MGB Coupling





The Engine side flexible coupling exhibits some buckling resulting from the crash loads. The coupling tube evidences some internal damages resulting from the mechanical interference with the drive shaft during the crash sequence and a significant elongation resulting from compressive load resulting from the impact force during the crash.

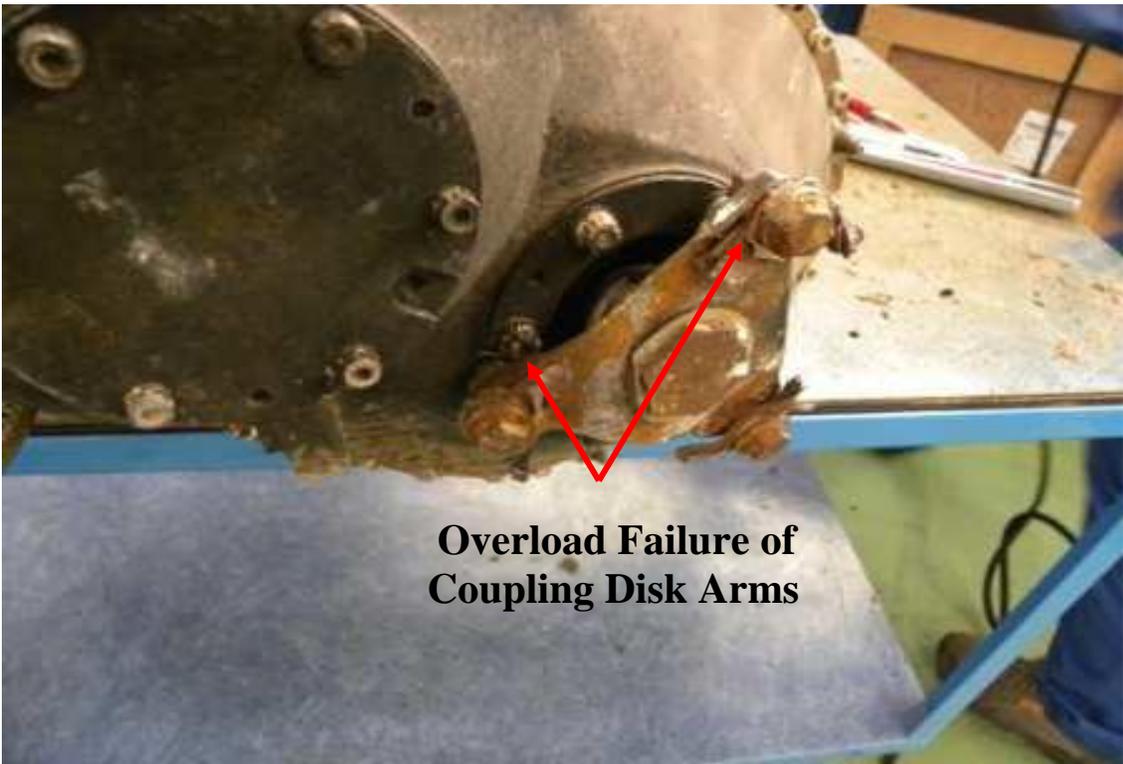




The examinations of the recovered part of the Engine to MGB coupling do not show any evidence of any pre-crash failure. All the damages observed during this examination are the consequences of overloads resulting from the crash sequence and relevant with a high compressive energy during the crash.

1.15.3 Engine To Tail Rotor Transmission Shaft Coupling

The Engine to Tail Drive Shaft flexible coupling is broken as the result of the crash (overload failure). The examination of the Engine to Tail Rotor Drive Shaft coupling does not indicate any evidence of pre-crash failure. The failure observed on this coupling is the consequences of the overloads resulting from the crash sequence.



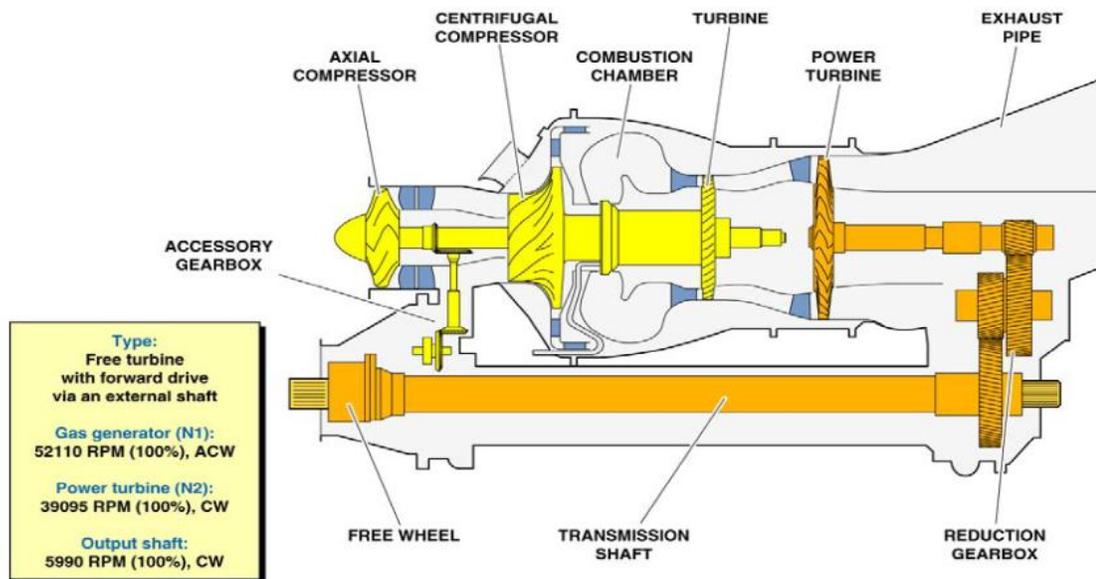
1.15.4 Analysis

The examination of the Tail Rotor Assembly, the recovered parts of the Engine to MGB coupling and the Engine to Tail Rotor Drive Shaft coupling do not point towards any evidence of pre-crash failure. All the damages observed are the consequences of the crash overload resulting from the impact and thermal damages resulting from the post crash fire.

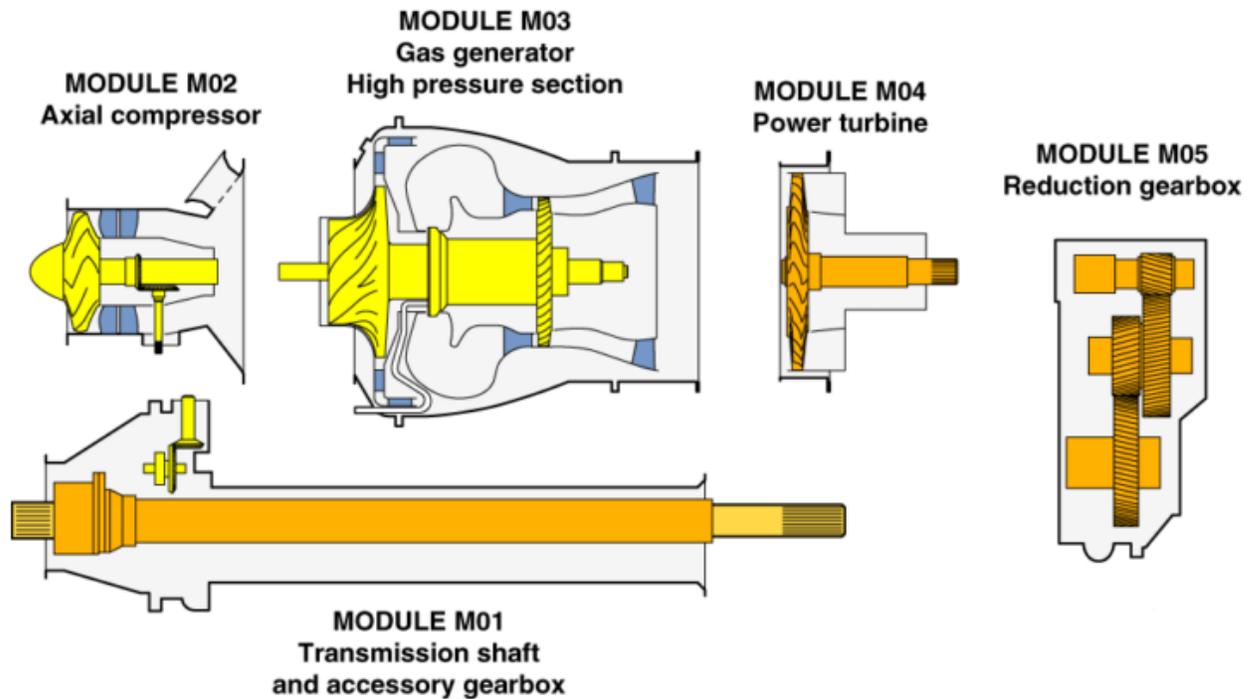
1.16 Engine

1.16.1 General

The Arriel 2B1 engine is a turbo shaft engine with a single stage axial compressor, a single stage centrifugal compressor, an annular combustion chamber, a single stage gas generator turbine, a power turbine and a reduction gearbox. The fuel system includes a dual channel Engine Control Unit.



ARRIEL 2B ENGINE LAYOUT



ARRIEL 2B ENGINE MODULAR LAYOUT

1.16.2 Engine Testing

The engine was recovered from the crash site and sent to the Turbomeca facility at Tarnos in France. However, the engine could not be tested due to damaged and burnt condition. It was dismantled by Turbomeca technical advisor in their facilities in Tarnos, France.

All engine parts were found to be seized except the free wheel, which operated correctly. The magnetic plugs were found to be burnt and without any trace of metallic particles. The reduction gearbox showed the marks were aligned on the transmission nut. The engine front attachment was bent. The transmission gear and accessory box gears were seized but in good condition. The axial compression erosion was within limits. One axial compressor blade displayed severe impact mark in the direction of rotation. The axial compressor shaft correctly drove the accessories gearbox. The bleed valve was in open position. The centrifugal

compressor was in good condition and its cover displayed rotating marks on half of the circumference. Burrs were observed on the centrifugal compressor blade tips. The compressor diffuser was in good condition. The combustion chamber was in good condition but its casing was severely damaged. Some foreign objects (organic particles) were seen in the area of the compressor diffuser and the combustion chamber showing that the engine was rotating at the time of the crash. The turbine was in good condition and could operate correctly. Its output shaft showed evidence of rotational marks.



ENGINE RECOVERED FROM THE CRASH SITE



Front attachment bent



Turbine casing severely impacted



Impact mark on axial compressor blade



Erosion check: compliant

1.16.3 ECU Recordings

The ECU was totally damaged due to post crash fire and no data could be retrieved.

1.16.4 Analysis

The engine tear down analysis does not show any pre-crash discrepancy. The engine has been damaged during the impact and by the post-crash fire. Some rotating marks could be observed.

1.17 Avionics Equipment



**VHF2/VOR KX
165A TSO**



**GTX 327
Transponder**



**ADF/VOR KR
87 TSO**



RA Transceiver



ECU



CONTROL PANEL

The computers were individually visually examined by the BEA in Turbomeca facilities in Tarnos, France. Evidence of severe fire damage was observed (over 600°C). At these temperatures, any electronic data stored in computers such as ECU is lost.

1.18 Instruments and Other Equipment

The airspeed indicator, a barometric air data instrument, is indicating around 30 kts. However, this value may not represent the value before the accident due to post-impact damages.



AIR SPEED INDICATOR



AC CONDENSORS



WIPER MOTOR



2A and 5A FUSES



STANDBY COMPASS

These equipment do not store any data and indicated symptoms of damage due to fire.

1.19 Analysis of the Examination Done at France

No data could be retrieved from the avionics, instruments and other recovered equipment. The needle of the airspeed indicator is showing about 30 knots, but this value may not be representative of the airspeed at the impact. The engine, tail rotor assembly and shafts examination didn't show any pre-crash discrepancy. Some rotating marks were observed on the engine.

1.20 Medical and Pathological Information

Pre-flight medicals of both the pilots, including breath analyser test, were carried out at Itanagar by the Senior Consultant, RKM hospital, Itanagar prior to the days flying. Both pilots were found fit. The bodies of both the pilots were badly charred and no viscera could be collected for further examination. The post mortem was carried out at District Hospital Tawang, Arunachal Pradesh. The post mortem reports of the pilots and one passenger confirm the cause of death is head injury and subsequently due to burning. The post mortem report of the Late Chief Minister and other passenger gives the cause of their death as Head Injury.

1.21 Fire

The helicopter fuselage appears to have broken into pieces due to impact and the subsequently the helicopter debris caught fire due to sufficient fuel being available.

1.22 Survival Aspects

The post mortem report indicates that the death of the occupants was due to head injury and post impact fire. Considering the terrain, the impact and the subsequent fire thereafter, the accident was not survivable.

The last communication with the helicopter was made at 0410 hrs UTC. ETA Itanagar was passed as 0535 hrs UTC. At 0623 hrs, the Aviation Officer at Tawang, informed the ATC at Tawang that the helicopter had not landed at Itanagar. ATC Tawang initiated overdue action. At 0610 hrs, Itanagar initiated overdue action and informed ATC Guwahati. At 0620 hrs, the WSO Guwahati informed the Jt GM(Aero), GM (Aero) and DGM (ATM) at Guwahati. Nearby bases were also activated. At 0724, Search Operations were activated. Two IAF Cheetah helicopters got airborne from Tezpur for SAR at 0746 hrs. At 0915 hrs, an OSD to CM of Arunachal Pradesh passed a message to Guwahati ATC that the helicopter of the CM had landed safely in Bhutan. The IAF Cheetah Helicopters landed back at Tezpur at 0946 hrs due to bad weather enroute. Considerable time and effort was wasted thereafter in search for the helicopter at Bhutan. On correlating various eyewitness statements and time of occurrence, it was understood that the reports were based on the observation of the helicopter when it was on the inbound leg to Tawang (positioning for the airlift of the CM and his entourage). Bad weather hampered the SAR by helicopters on subsequent days. The focus of the ground search was towards Sela pass and Bhutan border. ISRO was called in to assist the search on 1st May 11. On 2nd May 11, the IAF SU-30 aircraft were also utilized for SAR. Both the satellite pictures obtained from ISRO and the images taken by the

SU –30 aircraft did not give any clue of the probable crash site. No Emergency Transmitter Locator (ELT) messages from Cospas Satellite system were received by the Indian Mission Control Center (IMCC) on any frequency. No authentic information was thus available of the crash site to narrow down the SAR. The crash site was located on 4th May 2011 by Yak herder tribe of Brokpas who live at and around the area close to Lubuthang in an uninhabited area in the Kameng sector of Arunachal Pradesh at an approx altitude of 4600 metres. SAR operation was called off at 1250 hrs on 4th May 2011.

1.23 Tests and Research

1.23.1 Explosives Damage Report

The Bureau of Civil Aviation Security carried out examination of the samples collected from the site. In their report, they have ruled out the presence of explosive substances.

1.23.2 Fuel Sample Examination

A sample of fuel of the same batch as was used on the helicopter was obtained and subjected to full specification test at the DGCA Fuel Lab at Delhi. As per the report received there was no abnormality in the sample and it passed all the specification tests.

1.24 Organizational and Management Information

(a) M/S Pawan Hans Helicopter Ltd is a non scheduled Air Transport Operator and also engaged in Helicopter Charter Operations. One Ecureuil AS 350 B3 helicopter has been requisitioned by the Government of Arunachal Pradesh since 5th Dec 2010. However, no MoU has been signed between the indenting agency

(Govt of Arunachal Pradesh) and PHHL till the date of the accident i.e. 30th April 2011.

(b) The Commissioner of Aviation, Arunachal Pradesh Government had advised the CM against leasing of the single engine AS 350 B3 helicopter for VIP flights. The Commissioner had also advised the CM that single engine helicopters could not be used for VIP flights vide MHA letter No.VI.23018/8/2005-VS, dated 24.09.2009 and DGCA notification vide AV.14027/9/2008-AT-I dated 31.03.2009. However, the advice was overruled by the Chief Minister.

(c) The tasking of the AS350 B3 helicopter was done by the CM and his Secretariat, directly with the pilots. There was no representative of the Aviation department involved in the tasking of AS 350 B3.

(d) The relations between the Aviation Department of Govt of Arunachal Pradesh and PHHL were strained due to performance of PHHL not being satisfactory as per the user. The matter regarding the safety standards, poor serviceability of Mi-17 helicopters and the behavior of the crew has been taken up with CMD, PHHL by the Aviation Commissioner, Govt of Arunachal Pradesh, on various occasions.

(e) Tawang helipad is being regularly used (at least six days a week) for operations. The helipad lacks the necessary infrastructure for such regular operations.

1.25 Additional information:

Pilot Information:

Both the pilots were retired army officials and had undergone training on the helicopter in France. At the time of accident both the pilots were holding current

and valid CHPL. Both pilots were approved for special VFR operations. Both pilots did not have transit inspection approval to release the helicopter.

Terrain:

The terrain in the general area is hilly with narrow valleys and altitudes varying from 300 Metres to 5000 Metres. Thick foliage and steep slopes characterize the lower altitudes. The higher altitudes have lesser vegetation and have steep and rocky mountains. The area is sparsely populated, with population centered around a few prominent towns, mainly at lower elevations. The villages are sparsely populated and are few and far. The higher altitudes (above 4000 Metres), are populated generally by Yak grazing tribes and nomads. The site at which the debris is located is at an altitude of 4600 metres on a relatively lesser gradient, against a sheer mountain cliff. The terrain is rocky and has some snow around the site. The site is about 6 Km from the nearest village of Lubuthang, which consists of a few huts and is inhabited by the Brokas tribe.

1.26 Useful or Effective Investigation Techniques: Nil

2. ANALYSIS

2.1.1 Serviceability of the Helicopter

The Helicopter was imported by PHL from Eurocopter, France under NSOP Permit in the year 2010. The helicopter was received at Palam and assembled as per erection schedule on 19th July 2010. The helicopter was test flown as per approved Test Flight Schedule and offered for issue of Certificate of Airworthiness. The C of A was issued on 21st July 2010 and was valid till 20th July 2015. The helicopter had flown 360:00 hrs before first flight on 30th April 2011 and the last major schedule was carried out on at 267:25 Air Frame hours on 10th April 2011. There were no repetitive snags in the last 15 days. There were no major snags reported in the last

30 days. As per records made available, except for minor snags on Hydraulic and Fuel filter pop out indication there was no snag reported during the last 30 hours of operation. On 15th April 2011, a portable Oxygen cylinder was kept at the back of the pilots seat and strapped with locally made belt. There was no authority for positioning the oxygen bottle at that location. The statement obtained from the concerned AME reveals that this was done at the request of the pilots, as they had to occasionally fly at high altitudes. The portable cylinder had two masks attached to it and could be used by both/ either pilots. For passengers, four inhaler pumps were kept. As per the statement of the A.M.E it was not uncommon that the passengers used this help when they felt uneasy/ suffocated. There is no laid down procedure for use of oxygen by the crew. Engine Power Checks were carried out on 8th April, 17th April and 26th April 2011. All checks showed enough T4 margin and positive Tq margin.

Guwahati base has been approved for carrying out 100Hrs / 03 months inspection of AS 350 B3 helicopter and its engines. The last 100 Hrs inspection of the helicopter was carried out at Guwahati on 10th April 2011. There was no deficiency recorded. A qualified AME of PHHL certified the helicopter serviceable. The pilot also accepted the helicopter as per the standard procedure.

2.2 Why the ELT Failed to Transmit?

It was established that ELT was installed on the helicopter and was serviceable. The ELT had 121.5 MHZ and 406 MHZ as operating frequencies. Signals transmitted at 406 MHZ are used to pin point the location of the accident and initiate satellite based search operation of the aircraft/helicopter. The ELT antenna had got detached and ELT was destroyed in the impact and post impact fire. In view of failure of ELT to transmit distress signals in a number of previous accidents, installation and suitability of ELT location needs immediate examination.

An alternate system of flight following like the PRB needs to be examined and installed for prompt search and rescue in case of accident.

2.3 Weather

The weather at departure from Tawang was – Surface Winds 200° / 05 knots, visibility 6000 meters, Clouds- Few at 2000 feet, Few at 10000 feet and temperature of 18.8⁰ Centigrade. Thus the weather overhead Tawang was clear for VFR operations. Entry / Exit from Tawang Sector is made either through Sela pass or following the valley through Bhutan. The helicopters routeing via Sela pass are to climb to an altitude of 15,500 feet as per PPHL SOP. However, this route is to be followed only in good weather. Sela Pass is at an altitude of approx 14,000 feet and was partially visible. In the event of bad weather, the helicopters are to route via the Bhutan valley. Bhutan valley is at a much lower altitude and the height to fly, as per the SOP issued by PPHL, is 7000 feet. The weather in Bhutan valley was reported to be clear. According to eyewitnesses the weather towards Sela pass was marginal and all the ridges were covered with clouds. The satellite pictures of the day indicate substantial clouding over the hills. Hence, though the weather over Tawang was fair, the enroute weather appears to have not been conducive for VFR operations. The current weather observations maintained by the IAF at Tawang shows a steady increase in the clouding and by 0630 hrs UTC, the cloud amount had increased to six octa and Sela pass was not visible due to clouds.

2.4 Conduct of the Flight

2.4.1 Crew Qualification and Proficiency

Both the crew held valid license and were qualified on type. Their ratings were current. The PIC had a total flying experience of 4000 hrs out of which 181:00 hrs

were on AS 350 B 3 helicopter. Air Safety Circular 2 of 1981, Para 3.2 regarding carriage of VIPs in private / State Government owned aircraft states :-

3.3.2 When operation is by Helicopter:

3.3.2.1 The Pilot-in-Command should be in possession of a current Commercial Helicopter Pilots Licence.

3.3.2.2 The pilot should have a minimum of 500 hrs experience as Pilot-in-Command on Helicopters, including 10 hrs of night flying and not less than 75 hrs as Pilot-in-Command, on type of helicopter to be flown.

3.3.2.3 The pilot should have a minimum of 30 hrs experience as PIC on Helicopters in the last 6 months including 5 hrs on the type helicopter in the last 30 days immediately preceding the date of intended flight.

NOTES:

(ii) Whenever practicable, an additional pilot may be carried possessing current CHPL and IR rating.

Both the crew met all the requirements of the above air safety circulars on the date of the flight.

2.4.2 Flight Planning and Adherence to Procedures

a) The pilots carried out pre-flight medicals and obtained the ATC clearances and met briefing telephonically at Itanagar. No written Flight plan was faxed to Guwahati. No Flight plan was filed for the subsequent flights nor did the ATC at Guwahati insist on a Flight plan for the subsequent flights being made available.

This is a violation of laid down procedures by both the crew and the ATC.

b) The helicopter, after refueling, took off from Guwahati at 0316 hrs and landed at Tawang Army helipad at 0406 hrs. As per ATC at Tawang, the Captain did not give the mandatory R/T calls and contacted the ATC only when he was on finals to the helipad. There were already two Cheetah helicopters and one Mi-17

parked at the helipad. To ensure a safe landing, one Cheetah helicopter had to be repositioned hurriedly by the ground crew. **This points towards poor flight planning by the pilots as they were in a hurry, which was an impediment to safe operations.**

c) The helicopter landed close to the fuel pump and was refueled with 140 litres. The AS350 B3 helicopter does not have wheels and had to be started up to reposition at the 30 end of the helipad, to receive the CM of Arunachal Pradesh and his entourage. On arrival of the CM, the Captain asked for start up at 0420 hrs. This implies that within 14 minutes, the crew tested the fuel, supervised the refueling, repositioned the helicopter and did the necessary checks. Since there was no dispatcher or operational representative at Tawang, the pilots would have to obtain the necessary briefing of the weather by themselves. Completion of all the above tasks in the limited time period with the available manpower and communication facilities is not possible. The pilots did not obtain the current enroute and destination weather. **This indicates non adherence to procedures by the pilots.**

d) The helicopter started up and attempted to take off by carrying out a pick up with four passengers on board. In the process of the pick up the helicopter turned through 70-80° to the right in an uncontrolled manner. The Captain carried out a sit down and one passenger, OSD to CM, got down from the helicopter. A second pick up was attempted and another sit down was carried out. This time some luggage was off loaded from the helicopter. The helicopter carried out another pick up, but had to again sit down as the door of the helicopter was not closed and locked properly. **The deplaning of a passenger and luggage indicate that the Load and Trim were not calculated. This indicates poor flying discipline and is a violation of laid down orders. Attempting a take off without ensuring that the door of the helicopter is closed and locked is an indication of poor flying discipline.**

e) No passenger manifest of the flight was available with the Aviation Officer Tawang, or any other representative. **This is a violation of the laid down procedures.**

f) The weather enroute was reported to be marginal. The ATC at Tawang informed the pilot that the Sela pass was partially clear and Bhutan valley was clear. As per the PHHL SOP, in case of bad weather, the helicopter was to route via Bhutan valley. However, the pilots insisted on routeing via the Sela pass. **This is a violation of laid down SOP.**

The violation of SOPs, laid down orders and flying discipline is a contributory factor to the accident.

2.5 Spatial Disorientation

Reduced visibility conditions and combining VMC & IMC increase the risk of spatial disorientation. Spatial disorientation occurs when a pilot develops an incorrect perception of aircraft attitude, altitude or motion relative to the Earth's surface. It results when a pilot's normal visual cues to aircraft attitude are inaccurate, unavailable or inadequately monitored and the pilot, instead, relies on other cues to aircraft attitude that may be misleading. These cues are provided by the motion-sensing vestibular organs in each inner ear. Vestibular sensations are easily ignored when pilots have a clear view of the horizon, but they become compelling illusions when external visual references are not available. Situational risk factors for spatial disorientation include false surface planes created by sloping clouds or terrain, transitions between VMC and IMC that require the shifting of visual attention between external visual references and cockpit flight instruments.

The helicopter was flying through the clouds and there is great possibility of spatial disorientation, which could have resulted in loss of situational awareness. The pilots were not in contact with the ground and were unaware of their ground position and orientation. The workload of having to fly the helicopter and attempting to make contact with the ground added additional pressure on the pilots. It appears that in such a condition, when flying through clouds, with lack of external visual cues, the helicopter impacted the hill.

2.6 Management Issues, System of Maintenance and Operations.

(a) M/S Pawan Hans Helicopter Ltd is a non scheduled Air Transport Operator and also engaged in Helicopter Charter Operations. One Ecureuil AS 350 B3 helicopter has been requisitioned by the Government of Arunachal Pradesh since 5th Dec 2010. However, no MoU has been signed between the indenting agency (Govt of Arunachal Pradesh) and PHHL for AS 350 B3 operations. The Commissioner of Aviation, Arunachal Pradesh Government, had advised the CM against leasing of the single engine AS 350 B3 helicopter for VIP flights. The Commissioner had also advised the CM that single engine helicopters could not be used for VIP flights vide MHA letter No.VI.23018/8/2005-VS, dated 24th September 2009 and DGCA notification vide AV.14027/9/2008-AT-I dated 31st Mar 2009. However, the advice was overruled by the Chief Minister.

(b) For the smooth conduct of operations by any organization, there must be an operations head at each level. The same is also incorporated in the SOPs for operations of PHHL with a DGM of the region being responsible for all activities pertaining to operations. However, at present the DGM (NR) has also been officiating as the GM (Ops) since April 2009. Pawan Hans Helicopters Ltd does not have any operations personnel at the Director /GM level in the hierarchy as depicted in the organization chart to supervise conduct of Operations.

(d) PHHL conducts operations to regions like the North East and Lakshadweep by maintaining personnel on a rotational basis of 6 weeks on and 3 weeks off. There is a lack of consistency and understanding of operational aspects particular to these areas due to non availability of permanent staff. To ensure continuity, some staff need to be permanently posted to these areas.

(e) The operational aspects are all centrally controlled at either Delhi or Mumbai. The DGM (North East Region) was not aware of the operational aspects of his charter of duties as the head of North East region.

(f) There is no dedicated and independent Aviation Safety Organisation in the PHHL. Some personnel have been given an additional responsibility of ensuring safety. Considering the size of the fleet that the PHHL operates, the present strength of personnel deployed is insufficient to effectively look after the safety aspects.

2.7 Sabotage as a Cause of the Accident

The debris was examined to check for any evidence of any detonation or explosion in flight causing the accident. No evidence of any explosion was found. The post mortem reports of the bodies have not recorded any high-pressure waves as the cause of death.

2.8 Circumstances Leading to the Accident

a) The helicopter was on lease to the Government of Arunachal Pradesh since 5th Dec 2010. On 30th April 2011, the helicopter was tasked to carry 02 passengers from Itanagar to Guwahati and thereafter position the helicopter at Tawanag to carry the CM of Arunachal Pradesh and his entourage to Itanagar. The tasking was done by the Government of Arunachal Pradesh directly to the pilots. The pilots carried out pre-flight medicals and obtained the ATC clearances and met briefing telephonically at Itanagar. No written Flight plan was faxed to Guwahati. The helicopter was released for flying by a qualified AME of PHHL. The helicopter took off from Itanagar at 0200 UTC and landed at Guwahati. No Flight plan was filed for the subsequent flights nor did the ATC at Guwahati insist on a Flight plan for the subsequent flights being made available.

(b) The helicopter, after refueling, took off from Guwahati at 0316 Hrs and landed at Tawang Army helipad at 0406 hrs. As per ATC at Tawang, the Captain did not give the mandatory R/T calls and contacted the ATC only when he was on finals to the helipad. There were already two Cheetah helicopters and one Mi-17 parked at the helipad. To ensure a safe landing, one Cheetah helicopter had to be repositioned hurriedly by the ground crew. This indicates that the pilots were in a hurry which was an impediment to safe operations.

(c) The helicopter landed close to the fuel pump and was refueled with 140 litres. The AS350 B3 helicopter does not have wheels and after refueling, the helicopter had to be started up to be positioned at the 30 end of the helipad, to receive the CM of Arunachal Pradesh and his entourage. On arrival of the CM, the Captain asked for start up at 0420 hrs. This implies that within 14 minutes, the crew tested the fuel, supervised the refueling, repositioned the helicopter and did the necessary checks. Since there was no dispatcher or operational representative at Tawang, the pilots would have to obtain the necessary briefing of the weather by themselves. Completion of all the above tasks in the limited time frame with the available manpower and communication facilities is not possible.

(d) The helicopter was fully serviceable as no defect was reported by the pilot.

(e) The weather at the time of Take Off was reported as Winds 230⁰/05 Kts, Visibility 6000 Metres with Sela Pass partially visible and Bhutan valley clear. The Chief Minister of Arunachal Pradesh and three other passengers reported and went through the Army Security. The helicopter obtained clearance to start at 0420 hrs UTC. At 0423 hrs, the helicopter attempted to take off by carrying out a pick up with four passengers on board. As per the eye witness, who were present at the helipad, in the process of the pick up the helicopter turned through 70-80⁰ to the right in an uncontrolled manner. The Captain carried out a sit down and one passenger, got down from the helicopter. A second pick up was attempted and another sit down was carried out. This time some luggage was off loaded from the helicopter. The helicopter carried out another pick up, but had to again sit down as the door of the helicopter was not closed and locked properly. Subsequently, the helicopter got airborne at 0426 Hrs and routed via Banga Janga and Sela pass for Itanagar on an approximate direction of 160 - 180⁰. The estimated time of arrival at Itanagar was given as 0535 hrs. At 0436 hrs, the pilot reported position as overhead

Sela pass. The pilot also reported that Sela pass partially clear and a break through being there in the clouds over Sela. At 0440 hrs, the Captain reported 15 nautical miles clear of Sela pass and changed over the frequency to the valley frequency.

(f) The weather at that time was marginal, with clouds covering all the ridges and hill tops, as per the eyewitness statements. The Captain of the ill fated helicopter reported a break in the clouds. Due to lack of clear evidence (non availability of CVR, FDR or eye witness at the crash site), it is felt that the helicopter entered the pass through a break in the cloud patch and soon encountered clouds. In the process of negotiating weather, the pilots had either intentionally or inadvertently turned to the northeast side of Sela Pass, instead of proceeding in a south easterly direction, and impacted the hill, while still in clouds. It is also possible that the Captain was attempting to return to Tawang or aiming to break clouds and re- establish contact with the ground, when he impacted the hill, while in clouds. Accidents that occur in reduced visibility conditions, after a pilot has attempted VFR flight into IMC, are much more likely to be fatal than accidents that occur in Visual Meteorological Conditions (VMC) for various reasons which also includes spatial disorientation and getting into unusual altitude. Many helicopter accidents in India have occurred in such conditions and all such accidents have been fatal. It is imperative to note that the helicopter was neither cleared for IFR flight nor was it equipped with systems like weather radar or ground proximity warning systems, which could have given indications of weather or approaching terrain.

g) At 0623 Hrs, the aviation officer at Tawang, along with a few personnel from the Tawang Police Control Room came to the ATC at Tawang and informed that the CM's helicopter had not yet landed at Itanagar. The ATC at Tawang took the necessary overdue action of informing PA to DC Tawang, ATC Tezpur, MLC

Guwahati, the Air Force authorities at Guwahati and Shillong, Pawan Hans Guwahati and ITBP Tawang.

h) PHHL does not have any Flight following system in the north east. The senior most pilot of the type of helicopter operating from a base has been nominated as the person responsible for coordinating such activities. Since only one AS 350 B3 helicopter was stationed at Itanagar and both the pilots were flying, there was no flight following system. Since the Honourable CM was on board, overdue action was initiated by the Arunachal Pradesh officials. Search and Rescue was initiated but hampered due to the inclement weather. Initial reports came in that the helicopter was sighted in Bhutan valley. A considerable amount of time was wasted in searches in the Bhutan valley. However, on correlating the time of observation of the eyewitness, it became apparent that the helicopter had been sighted when it was enroute to Tawang helipad from Guwahati during the positioning flight. The crash site was located by Yak herder tribe of Brokpas who live at and around the area close to Lubuthang in an uninhabited area in the Kameng sector of Arunachal Pradesh at an approx altitude of 4600 metres. The pilots and three passengers received fatal injuries due to the helicopter impacting the rocky face of a steep cliff, falling approximately 200 metres to an area of relatively lesser gradient and subsequently catching fire.

3. CONCLUSIONS

3.1 Findings

(a) One Ecureuil AS 350 B3 helicopter has been requisitioned by the Government of Arunachal Pradesh since 5th Dec 2010. However, no MoU has been signed between the indenting agency (Govt of Arunachal Pradesh) and PHHL for AS 350 B3 operations.

(b) The Commissioner of Aviation, Arunachal Pradesh Government, had advised the CM against leasing of the single engine AS 350 B3 helicopter for VIP flights. The Commissioner had also advised the CM that single engine helicopters could not be used for VIP flights vide MHA letter No.VI.23018/8/2005-VS, dated 24th September 2009 and DGCA notification vide AV.14027/9/2008-AT-I dated 31st March 2009. However, the advice was overruled by the Chief Minister.

(c) The tasking of the helicopter was done by the Chief Minister of Arunachal Pradesh and his Secretariat, directly to the PHHL pilots.

(d) **There was no Operations manager of PHHL at Itanagar who would study and brief the crew about the task.** There was no representative of the Aviation department involved in the tasking of AS 350 B3. It was hence, solely at the discretion of the pilots. Any error of judgment by the pilots would not be corrected as there was no operational member involved in the decision making process.

(e) The helicopter was fully serviceable and no defects / snags were reported by the operators.

(f) **The pilots did not file a valid written flight plan at either Itanagar or Guwahati.** The details of the flight were telephonically passed to ATC Guwahati to obtain the ADC and FIC. The pilots should have faxed a copy of the Flt Plan to the ATC at Guwahati. The ATC at Guwahati also did not insist on a copy of the Flight

plan being made available after the helicopter landed at Guwahati, for the subsequent flights. **No written briefing was obtained from Guwahati Met by the pilots.**

(g) As per ATC at Tawang, the Captain did not give the mandatory R/T calls and contacted the ATC only when he was on finals to the helipad. There were already two Cheetah helicopters and one Mi-17 parked at the helipad. For a safe landing, one Cheetah helicopter had to be repositioned hurriedly. In addition the transit time at Tawang Army helipad was only 14 minutes. This indicates that **the pilots were under a tremendous hurry and were under pressure to complete the task in the required time frame which is an impediment to safe operations.**

(h) The helicopter landed at Tawang helipad at 0400 UTC. The pilots had to check the fuel for quality, refuel, prepare the load and trim tables, collect the passenger manifest, reposition the helicopter and commenced start up in a space of 14 minutes. In the absence of a dispatcher, the pilots had to obtain the weather enroute and at destination. The weather at the place of departure, ie., Tawang, was given by the ATC, on start up. Due to the paucity of time, it is possible that the Captain could not obtain the enroute and actual destination weather. **As per PPHLS SOP for operations from Tawang, the routeing from Tawang to Itanagar is- In case of Good Weather- Tawang- Sela Pass – Dhirang Valley – Bomdila – Jamuri pass – Bhalukpong – Itanagar. The helicopters are to climb to height of 15,500 feet to cross Sela Pass and then enter Dhirang valley, descending to 9000 feet and after crossing Balukpong, descend and maintain 5000 feet till Itanagar.**

In case of Bad Weather – Tawang – Lumla – Tashigang –Guwahati- Itanagar. The helicopter is to maintain 7000 feet on entering Bhutan valley and on exiting the hills, descend to 3000 feet.

However, despite the marginal weather, the Captain decided to route via Sela pass. Due to the paucity of time, the pilots would not be aware of the actual destination and enroute weather. Two other helicopters of the Indian Army routed from Tawang via Bhutan valley at 0513 hrs and landed safely at Guwahati and Misamari respectively.

(j) The weather at that time was marginal, with clouds covering all the ridges and hill tops, as per the eyewitness statements. The Captain of the ill fated helicopter reported a break in the clouds. Due to lack of clear evidence (non availability of CVR, FDR or eye witness at the crash site), it is felt that the helicopter entered the pass through a break in the cloud patch and soon encountered clouds. In the process of negotiating weather, the pilots had either intentionally or inadvertently turned to the northeast side of Sela Pass, instead of proceeding in a south easterly direction, and impacted the hill, while still in clouds. It is also possible that the Captain was attempting to return to Tawang or aiming to break clouds and re- establish contact with the ground, when he impacted the hill, while in clouds.

(k) Overdue action and Search and Rescue (SAR) was initiated. The SAR was hampered due the inclement weather. Initial reports came in that the helicopter was sighted in Bhutan valley. A considerable amount of time was wasted in searches in the Bhutan valley. However, on correlating the time of observation of the eyewitness, it became apparent that the helicopter had been sighted when it was enroute to Tawang helipad from Guwahati during the positioning flight. The crash site was located by Yak herder tribe of Brokpas who live at and around the area close to Lubuthang in an uninhabited area in the Kameng sector of Arunachal Pradesh at an approx altitude of 4600 metres. The pilots and three passengers received fatal injuries due to the helicopter impacting the rocky face of a steep cliff,

falling approximately 200 metres to an area of relatively lesser gradient and subsequently catching fire.

(l) At Tawang, the helicopter landed and commenced start up within 14 minutes. During this period, the crew tested the fuel, supervised the refueling, repositioned the helicopter and did the necessary checks. Since **there was no dispatcher or operational representative at Tawang, the pilots would have to obtain the necessary briefing of the weather by themselves. Completion of all the above tasks in the limited time frame with the available manpower and communication facilities is extremely difficult.**

(m) As per **CAR Section 3, series C, Part III, para 7.1.3**, the organization shall have an operations office with adequate management and operations personnel. Among the operations personnel, there shall be an Operations Officer/ Flight Despatcher responsible for the functions stated in para 4.6 of CAR section 2, Series O, part II & IV. **There were no operational personnel at Tawang to brief the flight crew about the weather condition prevailing enroute or at destination.** In all probability, the pilots did not obtain the weather at destination.

(n) As per **CAR Section 3, Series C Part III para 7.1.4**, there shall be a person responsible for operational control of each flight. He shall make an operational flight plan for each flight and shall be responsible for flight follow up. **There was no procedure adopted to conduct flight follow-up and the senior pilot who was himself flying was exercising the operational control of each flight.**

(o) As per **CAR Section 3, Series C, Part III, para 7.8.3**, Weight and Balance control procedures, including preparation of load and trim sheets and method of preservation of records of each flight are to be calculated and maintained. The

deplaning of a passenger and luggage indicate that the **Load and Trim were not calculated. Also, no passenger manifest of the flight was available with the Aviation Officer Tawang, or any other representative.**

(p) For the smooth conduct of operations by any organization, there must be an operations head at each level. The same is also incorporated in the SOPs for operations of PHHL with a DGM of the region being responsible for all activities pertaining to operations. However, at present the DGM (NR) has also been officiating as the GM (Ops) since April 2009. Pawan Hans Helicopters Ltd does not have any operations personnel at the Director /GM level in the hierarchy as depicted in the organization chart to supervise conduct of Operations.

(q) PHHL conducts operations to regions like the North East and Lakshadweep by maintaining personnel on a rotational basis 6 weeks on and 3 weeks off. There is a lack of consistency and understanding of operational aspects particular to these areas due to non availability of permanent staff. To ensure continuity, some staff need to be permanently posted to these areas.

(r) The operational aspects are all centrally controlled at either Delhi or Mumbai. The DGM (North East Region) was not aware of the operational aspects of his charter of duties as the head of North East region. **There is no operations personnel at the regional level to act as an interphase between the pilots and the indenting agency.**

(s) **There is no dedicated and independent Aviation Safety Organisation in the PHHL.** Some personnel have been given an additional responsibility of ensuring safety. Considering the size of the fleet that the PHHL operates, the

present strength of personnel deployed is insufficient to effectively look after the safety aspects.

(t) The helicopter did not have any CVR or FDR as it is not mandatory for helicopters with AUW below 5700 Kgs to be fitted with the same. Due to this valuable evidence was not available of the accident. In addition to accident investigation, CVR and FDR gives a very good input for monitoring and analysis of the pilots.

(u) Helicopter operations in the hills are VFR flights only. However, the weather in the hills changes rapidly, with little or no warning at times. Additionally, it has been noticed that the prediction of weather in the hills is often in-accurate due to local weather phenomenon peculiar to the hills. To assist the pilots to deal with such unforeseen situations, fitment of IFR instrumentation and aids like Ground Proximity Warning Systems and Weather Radars would go a long way in ensuring safety. The AS 350 B3 was not fitted with either of the systems which could have proved crucial when the pilots encountered weather after crossing Sela Pass.

(v) **As per CAR Section 3, series C, Part X**, multi engine fixed wing aircraft and single engine turbine or multi-turbine engine helicopters (passenger version) with good operational capability under IFR, reliability and easy maintainability shall be used for VIP flights. Air Safety Circular 2/1981 on the subject advises that only twin-engine helicopters be utilized for VIP flights. Also MHA directive vide letter No.VI.23018/8/2005-VS, dated 24th September 2009 to State Governments clearly states that no single engine helicopter be utilized for VIP flying. AS 350 B3 is a single engine helicopter and not cleared for IFR.

(w) As per CAR Section 2 Series F, part VIII, para 7.2, necessary transit inspection needs to be carried out by qualified crew. There was no engineer or technician posted or available at Tawang to carry out the refueling and turn around servicing of the helicopter. Refueling was done by the pilot himself, who was not certified for carrying out transit inspection by any competent authority. Presently PHLH pilots are not carrying out any transit inspection. The helicopter is released after a pre flight inspection by A.M.E and after the last flight of the day a post flight inspection is carried out. Between the first flight preflight inspection and the last post flight inspection, pilots fly sorties with their walk around inspection. In the hills, there is every chance of weather deteriorating and helicopter being stuck for long durations. It is strongly felt that the pilots be trained to carry out short transit inspection including fuel check for solid and water contamination. Such authorizations can be issued by the organisation as per relevant CAR.

(x) The crew in the North east were following a six weeks on and three weeks off routine. As per the Operations manual of PHLH, Chapter 2, para 2.4.5 (d), the minimum rest period shall be – “24 hours rest encompassing period 2000 hrs to 0600 hrs shall be provided to all pilots in any 7 consecutive days”. The pilots flew on nine consecutive days from 14th June 2011 to 23rd June 2011. This however, is not a direct cause of the accident as the pilots had adequate breaks before 30th April 2011.

(y) The ELT fitted on the helicopter did not give the required information of the crash as it got damaged/ burnt by the fire.

(z) Regular revenue operations are being carried out to Tawang by PHLH. The ATC at Tawang army helipad is manned by IAF personnel solely for controlling military helicopters carrying out Logistic Support sorties to Indian Army and

paramilitary organizations like the BSF. There is no State Government or AAI controller for providing Air Traffic Services. **The helipad does not meet the specifications of a regularly used helipad.**

(aa) The maintenance of the helicopter was carried out by manufacturer trained authorized A.M.Es. The A.M.Es are on rotation basis and are positioned at Arunachal Pradesh for a short period of 4 to 6 weeks. There is no definite handing over taking over procedure. In most cases the relieving engineer finds about the helicopter himself as the relieved engineer is in a hurry to come back. It is recommended that at least three days of overlap period for smooth transition from one control to another.

(ab) The engineers are working as per their capability, there is no organization barrier for identifying their mistakes. A senior engineer, technically sound on type of helicopter, should be positioned at outstation, who, on regular basis keep monitoring and carry out audit. Audit should also be carried out by trained auditors from other base / H.Q. Such audit should be carried out as per plan and more frequently when a new type of machine is inducted. H.Q quality department should on the basis of daily reports identify areas for auditing in advance and Q.A department personnel should be briefed. Auditing by junior officer whose appraisal is carried by Production department be avoided as no meaningful audit can be done, if his further progress in the organization is feared. **Quality Assurance department should have sufficient number of trained auditors and they should be directly reporting to the Accountable Manager.**

(ac) Any equipment / system installed on aircraft should have legal authority, non availability of such document renders the helicopter un-airworthy as un-authorized work has been carried out on the helicopter. The A.M.Es along with particular

helicopter should be trained on regulation at each recurrent training course. This issue should be highlighted through Technical circular for every one in the organization to note and training department be advised accordingly.

(ad) As observed during interaction with technical staff it has come to light that many are not conversant with his charter of duties. The same person is holding a number of posts to fulfill the regulatory requirement. In a large organisation like PHHL middle level management should be groomed to take responsibility and nurtured for a typical position where he can devote time and apply his mind. Organisation should arrange for **role oriented training for their middle level managers.**

(ae) As was observed on scrutiny certain inspection schedule had irrelevant equipment included in the schedule. This definitely shows that monitoring lapse by the relevant group. All schedules should be periodically scrutinized for suitability, adoptability and correctness.

3.2 Probable Cause of the Accident

The probable cause of the accident is inadvertent controlled flight into terrain in inclement weather.

4. RECOMMENDATIONS

(a) Only IFR certified twin-engine helicopters be utilized for VIP flights. CAR Section 3, series C, Part X may be suitably amended to resolve the ambiguity and to keep in consonance with MHA instructions vide letter No. VI 23018/8/2005-VS dated 24th September 2009.

(b) The organizational structure of Pawan Hans Helicopters Ltd needs to be restructured to include an Operations head at the Executive Director level and at the regional level (GM/ DGM level) to supervise conduct of Operations. Also, the QRs for each managerial vacancy may be clearly defined and a merit based promotion policy based on an annual report of the individual's performance be pursued.

(c) Considering the number and type of helicopters that the PHHL operates, there is a need to put in place a dedicated and independent Aviation Safety Organisation which would include personnel from the Operations, Maintenance and Administration and reporting directly to the CMD.

(d) An operation's personnel needs to be placed at each regional level to act as an interphase between the pilots and the indenting agency.

(e) To ensure continuity in understanding of operations, maintenance practices and administrative aspects particular to a region, some staff need to be permanently posted to these areas. Alternately, there must be sufficient overlap between the incoming and outgoing detachments.

(f) A procedure needs to be set in place to conduct flight follow-up and the dedicated personnel need to be earmarked and placed to exercise the operational control of each flight as specified in CAR Section 3, Series C Part III para 7.1.4.

(g) The instructions laid down vide CAR Section 3, Series C, Part III para 6.9, regarding submission of flight plan needs to be followed in letter and spirit by the Air Traffic Controllers.

- (h) At present the testing of the pilots is done by designated examiners of the same organization. An independent body should conduct the testing of the aircrew on a periodical basis to avoid chances of complacency setting in.
- (i) All aircraft and helicopters irrespective of the weight category be fitted with CVR and FDR.
- (j) All helicopters should be fitted with IFR instrumentation systems including Weather Radar and aids like the Ground Proximity Warning Systems.
- (k) It needs to be emphasized to all the VIP's not to exert pressure on the pilots and operators to undertake flights where safety may be compromised.
- (l) All regularly used helicopter routes need to be approved by DGCA. The routes must include reporting points and levels to be maintained.
- (m) Regular courses may be conducted by aviation psychologists for aircrew on behavioral science, methods of handling pressure and stress management.
- (n) Single engine helicopter pilots need to be imparted regular training on simulators for handling practical emergencies and exposure to instrument flying to assist them in case of inadvertently encountering inclement weather.
- (o) Personal Rescue Beacons may be carried in addition to ELTs especially in helicopters. All helicopters should be fitted with GPS locators which provide continuous update of position especially those flying in remote and inaccessible

areas. All helicopters should also be equipped with a personal survival pack depending upon the area of operations.

(p) IMD needs to integrate all available weather radars to provide a composite Met Data especially of weather in the hills.

(q) The infrastructure in the hills at regularly used helipads like Tawang must be improved to include a full-fledged ATC, Met, and Communication facilities.

(r) The size of helipads, the facilities available and emergency response systems at helipads in regular use must be as laid down in the CAR.

(s) The responsibility of providing Air Traffic Services at Tawang between IAF, the State Government and the AAI needs to be clearly identified.

(t) PHHL needs to train pilots for carrying out transit inspection and obtain the necessary certification in respect of its pilots.

(u) All operators should obtain the necessary OEM sanction for fitment of the additional equipment for operations.

(v) The SAR system in India needs to be modernized with the procurement of aircraft with synthetic aperture radar and capability to look through clouds and foliage must be looked into. Capability of the ISRO to assist in such exigencies also needs to be upgraded.

(w) There has been limited or no investment into the creation of infrastructure suitable for helicopter flying in the country. Measures like enhancing the VHF range by means of VHF repeater stations or automated dependent surveillance broadcast (ADSB) may also be considered. There is also a need to implement an effective flight following system based on satcom technologies. The system should be capable of transmitting the actual position of the helicopter enroute at regular intervals. This will also facilitate the operator to monitor the movement of their helicopters at any given time during its operation.

(x) It is recommended that a “Civil Aviation Authority” be commissioned which would have the following mandate :-

- 1) Independent examining boards for Air Crew, Ground Crew and Cabin Crew.
- 2) Independent financial powers including powers to hire staff at prevailing commercial rates.
- 3) Independent functional control with the administrative control under the ministry of Civil Aviation.

(y) Central Government should set up an independent “Accident Investigation Bureau” in accordance with International Standards for investigations of accidents and serious incidents. Further the Accident Investigation Bureau should have financial and administrative independence.

(z) Defence procurement policy of year 2010 has been modified to include Commercial Aviation in the offset clause. This implies that defence offset investment could also be utilized to the optimal level in the Civil Aviation Sphere.

(aa) DGCA may consider increasing the manpower posted in the north-east region for effective monitoring and control of operations in the region.

MEMBER
P. K. CHATTOPADHYAY
JDG, DGCA (RETD)

MEMBER
T. V. UNNIKRIISHNAN
GROUP CAPTAIN (RETD)

CHAIRMAN
AIR MARSHAL P. S. AHLUWALIA (RETD.)
PVSM, AVSM & Bar, VM, VSM

Date:

Place:

GLOSSARY OF ABBREVIATIONS USED IN THE REPORT

AAI	Airport Authority of India
Ac	Alto Cumulus (Clouds)
ADC	Air Defence Clearance
ADF	Automatic Direction Finder
A/F	Air Frame
AME	Aircraft Maintenance Engineer
ATC	Air Traffic Control
CAR	Civil Aviation Regulations
CHPL	Commercial Helicopter Pilots Licence
Ci	Cirrus (Clouds)
CM	Chief Minister
C of A	Certificate of Airworthiness
CSN	Cycles Since New
Cu	Cumulus (Clouds)
CVR	Cockpit Voice Recorder
DC	District Commissioner
DFDR	Digital Flight Data Recorder
DME	Distance Measuring Equipment (Navigation Equipment)
ECU	Engine Control Unit
ELT	Emergency Transmitter Locator
ETA	Estimated Time of Arrival
FADEC	Full Authority Digital Electronic Control
ICAO	International Civil Aviation Organisation
IMCC	Indian Mission Control Centre
ISRO	Indian Space Research Organisation

JLB	Journey Log Book
FIC	Flight Information Centre
FRTO	Flight Radio Telephone Operator
GPS	Global Positioning System
IAF	Indian Air Force
ILS	Instrument Landing System
IMC	Instrument Met Conditions
IR	Instrument Rating
ITBP	Indo Tibetan Border Police
Met	Meteorological
MoU	Memorandum of Understanding
MGB	Main Gear Box
MLA	Member of Legislative Assembly
MLC	Movement Liaison Centre
NSOP	Non Scheduled Operators Permit
OSD	Officer on Special Duty
PA	Personal Assistant
PHHL	Pawan Hans Helicopters Limited
PIC	Pilot in Command
POB	Persons on Board
PRB	Personal Rescue Beacon
P& T	Post and Telegraph
RCC	Rescue Coordination Centre
SAR	Search and Rescue
SOP	Standard Operating Procedures
SRR	Search and Rescue Region
SSR	Secondary Surveillance Radar

T4	Temperature
TAF	Terminal Area Forecast
TCu	Towering Cumulus (Clouds)
TGB	Tail Gear Box
TSN	Time Since New
Tq	Torque
Sc	Strato Cumulus (Clouds)
St	Stratus (Clouds)
UTC	Universal Coordinated Time (GMT)
VFR	VISUAL FLIGHT RULES
VHF	Very High Frequency
VOR	VHF Omni Range (Navigational Equipment)
WSO	Watch Safety Officer (ATC)

