FINAL INVESTIGATION REPORT ON RUNWAY EXCURSION INCIDENT TO M/s. NATIONAL FLYING TRAINING INSTITUTE PVT LTD DIAMOND DA 40 AIRCRAFT, VT-NFK ON 17.06.2017 AT GONDIA AIRPORT, NAGPUR, MAHARASHTRA

GOVERNMENT OF INDIA
OFFICE OF DIRECTOR OF AIR SAFETY (WESTERN REGION)
INTEGRATED OPERATIONAL OFFICE COMPLEX,
SAHAR ROAD, VILEPARLE (E), MUMBAI – 400099

Foreword

In accordance with Annex 13 to the Convention on International Civil Aviation Organization (ICAO) and Rule 13(1) of Aircraft (Investigation of Accidents and Incidents), Rules 2012, the sole objective of the investigation of an accident shall be the prevention of accidents and incidents and not apportion blame or liability. The investigation conducted in accordance with the provisions of above said rules shall be separate from any judicial or administrative proceedings to apportion blame or liability.

This document has been prepared based upon the evidences collected during the investigation, opinion obtained from the experts and laboratory examination of various components. Consequently, the use of this report for any purpose other than for the prevention of future accidents or incidents could lead to erroneous interpretations.

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ABBREVIATIONS

A/c	Aircraft
Aircraft	Incident aircraft
AMSL	Above Mean Sea Level
AOP	Air Operator Permit
ARC	Airworthiness Review Certificate
ASDA	Accelerate -Stop Distance Available
ATC	Air Traffic Control
CFT	Crash Fire Tender
CSN	Cycles Since New
CVR	Cockpit Voice Recorder
DME	Distance Measuring Equipment
DVOR	Doppler Very High Frequency Omni Range
FCOM	Flight Crew Operating Manual
FCTM	Flight Crew Training Manual
FDR	Flight Data Recorder
FRTO	Flight Radio Telephone Operator
GPS	Global Positioning System
Ground	Surface Movement Control
IAS	Indicated Air Speed
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
ILS	Instrument Landing System

IR	Instrument Rating
LDA	Landing Distance Available
LDG	Landing
LHS	Left Hand Side
MEL	Minimum Equipment List
MAP	Missed Approach Point
NDB	Non-Directional (Radio) Beacon
Operator	AOP holder of the incident aircraft
PAPI	Precision Approach Path Indicator
PDR	Pilot Defect Report
PIC	Pilot in Command
QNH	Pressure Setting to Indicate Elevation
QRH	Quick Reference Handbook
RA	Radio Altitude
RADAR	Radio Detection and Ranging
RWY	Runway
SCT	Scattered
SOP	Standard Operating Procedure
SPL	Student Pilot's License
TO/GA	Take-off/ Go-around- thrust lever position
TODA	Take-off Distance Available
TORA	Take-off Run Available
TSN	Time Since New

TWY	Taxiway
UTC	Coordinated Universal Time
VFR	Visual Flight Rules
VOR	Very high frequency Omni Range

FINAL INVESTIGATION REPORT ON RUNWAY EXCURSION INCIDENT TO M/s. NATIONAL FLYING TRAINING INSTITUTE PVT LTD (NFTI) DIAMOND DA 40 AIRCRAFT VT-NFK AT GONDIA ON 17.06.2017

GENERAL INFORMATION

1.	Aircraft	Type	:	DIAMOND
		Model	:	DA 40
		Nationality	:	INDIAN
		Registration	:	VT-NFK
2.	Name of the Owner/ Operator		:	NATIONAL FLYING TRAINING INSTITUTE PVT LTD
3.	Place of the incident		:	GONDIA AIRPORT, MAHARASHTRA
4.	Date and time of incident		:	17.06.2017, approx. 0950UTC
5.	Pilot in command		:	STUDENT PILOT LICENSE HOLDER
	Extent of Injuries		:	NIL
6.	No. of Passengers onboard		:	NIL
	Extent of Injuries		:	NIL
7.	Geographical location of site		:	Lat 021 Deg 31’ 24.78” N
	Of Occurrence (Lat. Long)		:	Long 080 Deg 17’ 15.7” E
8.	Last point of Departure		:	VAGD, GONDIA AIRPORT
9.	Point of intended landing		:	VAGD,GONDIA AIRPORT
10.	Type of operation		:	TRAINING FLIGHT (SOLO)
11.	Phase of operation		:	LANDING
12.	Type of occurrence		:	RE: RUNWAY EXCURSION

(ALL TIMINGS IN THE REPORT ARE IN UTC)

SYNOPSIS

Diamond DA-40 aircraft VT-NFK, belonging to M/s National Flying Training Institute (NFTI), Gondia was involved in a runway excursion incident at Gondia on 17.06.2017 during training flight. The student pilot was scheduled for a solo training flight (Circuit and Full stop landing) at Gondia airfield on 17.06.2017.

After carrying out the intentional go around in the first circuit, the aircraft approached again for the full stop landing according to the plan. The aircraft had a high touchdown attitude at the landing phase causing bounce after touchdown followed by tail touch. Student pilot then initiated procedure for go-around but the aircraft went into stall. The aircraft then had its left wing dropped and the left wing contacted the RWY surface. The nose wheel of the aircraft made an impact on the ground causing the nose landing gear to detach from the strut. The aircraft veered to left and then went out of the RWY into the kutcha area and finally stopped approx 150 feet left from the RWY 22 edge.

The incident was reported to DGCA and the investigation was instituted under Rule 13(1) of Aircraft (Investigation of Accidents and Incidents) Rules 2012 by appointing Inquiry Officer. The incident occurred in day time. The investigation revealed that improper flare and the bounce recovery technique as the probable cause of the incident.

1. FACTUAL INFORMATION:

1.1 **History of Flight:**

On 17.06.2017, a Diamond DA-40 aircraft, registration VT-NFK was scheduled for training sorties. The daily inspection for the aircraft VT-NFK was completed by an authorized AME as per the approved schedule and nil observations were made. The Certificate of Release to Service (CRS) was issued thereafter at 0250 UTC. There were no pending snags in the journey log book before release of aircraft. Subsequently, the aircraft flew for two training sorties of 01:25 hours each with different crew on board before the incident sortie. The instructor of the involved student pilot was the PIC of the flight before the incident flight. Both the sorties were uneventful and aircraft got chocks ON at 0805UTC.

On 17.06.2017, the Student Pilot reported for briefing at 0230 UTC. After the briefing, the student pilot took rest till 0700UTC and reached the hangar thereafter. The student pilot was planned for a dual sortie with his instructor and the same was informed to him vide email on the day before i.e 16.06.2017. His instructor had dual sorties on the same aircraft. When instructor landed back after the sortie, the student pilot requested him permission for a solo general flying. As the weather and winds were found suitable for solo general

flying, instructor gave permission for the same. The briefing was then given to the student pilot to carry out the sortie comprising one intentional go around followed by full stop landing. The flight plan was revised by the student pilot. Dy.CFI authorized student pilot to carry out solo general flying.

After completing the documentation procedure, the student pilot reached the allotted aircraft, VT-NFK. After completing the preflight inspection of the aircraft and being found satisfactory, the run up checks for the general flying was carried out by the student pilot with due permission from ATC. There were no snags mentioned in the Journey Log Book in the previous sectors. The student pilot accepted the aircraft at 0815 UTC and the chocks were OFF at 0840UTC. Total fuel onboard at the time of departure was 136.3Kgs. The preflight medical check was not carried out by the student pilot.

The student pilot took permission from ATC for takeoff for sector flying from RWY 22 and the aircraft took off at 0850UTC. The flight rule of VT- NFK was VFR and the visibility recorded was 6km. The takeoff was uneventful and the student pilot during the allotted sector carried out the basic maneuvers like level medium turns and slow flight. After the sector flying the aircraft returned back at dead side RWY22 for joining traffic circuit for landing. The request to join traffic circuit was made by the student pilot at 093601 UTC and the clearance was provided by ATC to join the traffic circuit RWY22 along with traffic pattern. Later VT-NFK joined traffic circuit and then was cleared to descend to circuit altitude (2000ft). At 0942UTC aircraft reported on final RWY22 and requested for intentional go around as part of the training and the clearance was provided by ATC for the practice of go around RWY22. The student pilot carried out the go around uneventfully and continued for another circuit.

Following one circuit, VT-NFK made the second approach and reported on final RWY22 at 094848UTC and informed ATC about the full stop landing. The clearance for a full stop landing was provided by ATC at 094855UTC. Winds reported by ATC were calm. The second approach made by the student pilot was high in the beginning. The student pilot managed to bring the aircraft to glide path at around 1200ftAMSL. At the landing phase, the aircraft had a high touchdown attitude causing a sudden rise in the rate of descent during the touchdown which resulted in bounce. Student pilot then initiated go-around procedure but he pulled the nose up more than required resulting in tail strike. The high pitch up attitude caused the aircraft to stall with a left wing drop. Subsequently, the left wing contacted the RWY surface followed by nose wheel impact, causing the nose landing gear to detach from the strut.

The aircraft continued to veer left, went out of the RWY into the kutcha area, and stopped approx 150 feet left from the RWY 22 edge in the kutcha area close to drainage canal. The

crash siren and fire alarm was activated by ATC and fire station was informed. Ambulance and CFT reached the site however the student pilot came out of the aircraft unhurt on his own.

1.2 **Injuries to persons :**

Injuries	**Crew**	**Passengers**	**Others**
Fatal	Nil	Nil	Nil
Serious	Nil	Nil	Nil
Minor	Nil	Nil	Nil
None	01	Nil	Nil

1.3 **Damage to Aircraft :**The aircraft sustained following damages:-

i. : Bottom of engine cowling damaged
ii. : Propeller damaged with dent at the tip of the spinner
iii. : Nose landing gear broken and separated from strut
iv. : Exhaust tailpipe was found pressed and damaged
v. : LH main landing gear strut bent from the centre
vi. : LH wing leading edge cracked and wingtip damaged
vii. : LH outboard trailing edge wing surface damaged of length 5inches
viii. : LH aileron top(13inches) as well as bottom surface(4inches) damaged
ix. : Tail skid scrapped
x. : Nose landing gear tire, tube and hub damaged
xi. : Air filter and air intake box crushed due to ground impact
xii. : Engine fuel drain tube damaged due ground impact
xiii. : Engine mount and alternate air mechanism damaged
xiv. : Lower fuselage surface near the gascolator panel damaged

Fig 1. Damage to left wing tip

Fig 2. Scraped tail shoe

Fig 4. Final position of the nose landing gear after break off (on TWY B shoulder)

Fig 3. Nose landing gear sheared and strut bent

1.4 **Other Damage :**

i. : Damage happened to the surface of Runway–Taxiway B joining area due to left wing scrape, propeller strikes and nose strut scrape. (Ref Fig 12, Fig 13 and Fig 14).

1.5 **Personnel Information :**

1.5.1 Pilot in Command:

a.	Age	:	23 years
b.	Gender	:	Male
c.	Date of birth	:	17.08.1993
d.	License details:		
	i. SPL	:	issued on 12.05.2016 valid till 11/05/2021
	ii. FRTOL No.	:	issued on 22.06.2016 valid till 21/06/2026
e.	Medical Assessment (Class I)	:	valid till 21/02/2018
f.	Total Flying hours	:	70 Hours 45 Minutes
g.	Dual Flying hours	:	47 Hours 20 Minutes
h.	Solo Flying Hrs	:	23 Hours 25Minutes
i.	Date of first solo flying	:	17.03.2017
j.	Total Flying experience during last 90 days	:	52 Hrs 50 minutes
k.	Total Flying experience during last 30 days	:	23 Hrs 50 minutes
l.	Total Flying experience during last 07 days	:	02 Hrs 50 minutes
m.	Total Flying experience during last 24 hours	:	NIL
n.	Previous Incident History	:	PIC does not have any past incident history.

The student pilot had adequate rest before he operated the flight on 17.06.2017. Upon scrutiny of the records, student pilot had his last flight on 14.06.2017 (Dual sortie Instrument Flying).As per the statement given by the student pilot, on the day of incident, he carried out the preflight inspection, started the engine, and did the run up checks before taking off for general flying. He carried out the basic maneuvers like level medium turns, steep turns and slow flight in the allotted sector. ATC was asked permission for rejoin and with the permission he started the first approach. As briefed by his instructor before the sortie, he carried out the intentional go-around in his 1st circuit.

For the 2nd circuit, he gave his intention to ATC for a full-stop landing. As per the student pilot, on finals his approach was stabilized, which includes aircraft in landing configuration, maintaining center line, on glide path, speed 70(-0+5) kts, MAP I5" (+2). As per him by 300ft AGL these all criteria's were met and he continued to land. For landing, he did a normal round off procedure and put throttle to idle, after which the main-wheels touched slightly the RWY. Thereafter the aircraft bounced and as instructed by his instructor before the sortie, he initiated the go-around as he was not feeling stable with ballooning. But the aircraft was sinking at that time and so instinctively he pulled

back the control stick more than required. Simultaneously the aircraft banked towards left. Next thing the student pilot experienced was the aircraft bounce on the RWY and then propeller struck.

1.6 **Aircraft Information:**

The Diamond DA40 is a four-seat, single engine, light aircraft constructed from composite materials. The metal skin of the aircraft is riveted, which allows loads to be spread out over the structure. Built in both Austria and Canada, it was developed as a four-seat version of the earlier DA20 by Diamond Aircraft Industries.

Diamond DA 40 aircraft VT-NFK bearing aircraft serial No. 40.1149 was manufactured in the year 2012 by Diamond Aircraft Industries. The aircraft was issued Certificate of Airworthiness (C of A) by DGCA India on 13.12.2012.The C of A was issued in Normal category and Passenger sub category. The aircraft has a maximum passenger capacity of three and has Maximum All Up Weight of 1200 Kgs. A minimum of one flight crew is required to operate the aircraft. The last Airworthiness Review Certificate (ARC) was issued on 09.02.2017 which was valid up to 08.02.2018.

Aircraft had done 4333:45 hours since new. The aircraft had done 426:05 hrs since last ARC till the time of incident. The aircraft was fitted with one Lycoming engine model no. IO-360-M1A engine bearing S/No. L-27326-51E which had completed total of 4533:45 hrs since new and 335:05hrs since last engine overhaul. The aircraft was fitted with two blade constant speed variable pitch HC-C2YR-1BFP propeller.

Last 100 hrs/ 06 months inspection was carried on this aircraft at 4254: 50 hrs on 23.05.2017 and since then the aircraft has flown 78:55hrs till incident sector. Last 50 hrs/ 03 months inspection was carried on this aircraft at 4304:20 hrs on 07.06.2017 and since then the aircraft had flown 29:25hrs till the incident sortie. Aircraft had undergone 25 hours inspection schedule on 15.03.2017 at 4022:25hrs and found satisfactory and aircraft had flown 311:20hrs after that. The weight of the aircraft at the time of take-off was 1029.38 Kgs which included 136.3Kgs of fuel.

The aircraft and its engines were being maintained as per the maintenance program consisting of calendar period/ flying Hours or Cycles based maintenance as approved by Directorate General of Civil Aviation (DGCA).There was no snag reported by the previous sector crew on the aircraft and no snag was pending for rectification. No DGCA mandatory modification was pending and there was no MEL invoked on this aircraft at the time of incident.

a.	A/c Registration	:	VT-NFK
b.	A/c Sl. No.	:	40.1149
c.	Year of Manufacture	:	2012
d.	Date of registration	:	12.12.2012
e.	Date of issue of noise certificate	:	12.12.2012
f.	Date of issue of C of A	:	13.12.2012
g.	Engine Type	:	Lycoming IO-360-M1A
h.	Engine SL no.	:	L-27326-51E
i.	Propeller Maker	:	Hartzell Prop. Inc.
j.	Propeller Model	:	HC-C2YR-1BFP/F7497
k.	Propeller hub SL no.	:	N5700B
l.	Propeller Diameter	:	74inches
m.	ARC Validity	:	08/02/2018
n.	A/c TSN	:	4333:45 Hrs
o.	Engine TSO	:	335:05 Hrs
p.	Propeller TSO	:	1375:05 Hrs
q.	Aircraft landing weight	:	990.58kg approximately

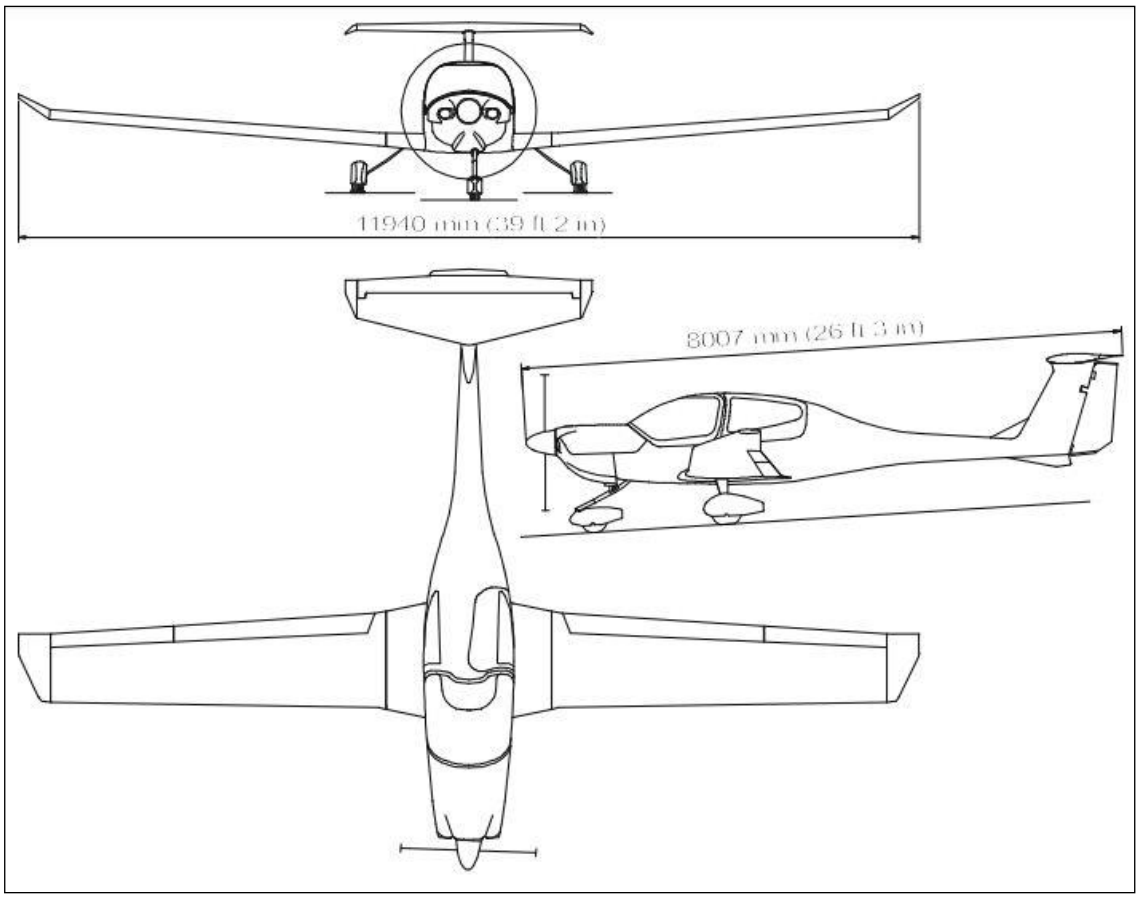

Fig.5 DA 40 aircraft schematic diagram

1.7 **Meteorological Information:**

NFTI obtained weather from Gondia airport over telephone and from Nagpur, Raipur and Jabalpur airports over internet and recorded the weather in its METAR record.
The scrutiny of MET record showed that on 17.06.2017 at 0950UTC, the visibility was 6000 m and winds were 180/05kts.The weather at Gondia as per METAR records was reported as follows:

Time (UTC)⟶	0900	0930	0950(special)	1030
Wind	260/05kts	180/03kts	180/05kts	240/04kts
Visibility	6000m	6000m	6000m	6000m
Clouds	NSC	NSC	NSC	FEW 2500ft
Temp	39	39	39	40
Dew Point	23	23	23	23
QNH	Q1002	Q1002	Q1001	Q1001

As per the ATC tape transcript, the wind reported to the student pilot along with landing clearance during the second approach for RWY 22 was 'calm'. However, there were no specific speed or directions provided by ATC on wind.

1.8 **Aids to Navigation:**

Gondia airport is equipped with DVOR (frequency 114.2 MHz), DME (frequency 1113/1176 MHz) and NDB (frequency 230 kHz). PAPI & ILS CAT-I is installed on RWY 04 and RWY 22 is facilitated with PAPI only. There were no known navigation aid difficulties reported by the student pilot.

1.9 **Communications:**

The aircraft as well as the ATC Gondia was equipped with Very High Frequency (VHF) radio telephony. At the time of incident, aircraft was having two way communications with the ATC at the tower frequency 118.35MHz. The aircraft was cleared by ATC for landing at 09:48:55UTC, as recorded in the ATC time, which was the last communication between the

aircraft and the ATC. No significant observation was made from the ATC tape transcript. There was no snag reported in the communication system of either the aircraft or the ATC.

1.10 **Aerodrome Information:**

Gondia Airport (VAGD) is located at Birsi village, 12 kilometres North-East of Gondia, Maharashtra, India. It is used for general aviation and pilot training. Gondia airport is controlled by Airports Authority of India. It is situated at an elevation of 987 feet with coordinates of Lat 021 Deg 31' 24.78" N and Long 080 Deg 17' 15.7" E. The airport has a single RWY (04/22) with a length of 2,290 metres (7513ft) and width of 45 metres. The surface of the RWY is level and paved with bitumen. The main apron measures 100m x 150 m. The airport is equipped with a Non Directional Beacon and DVOR, Distance Measuring Equipment, Instrument Landing System and night landing facilities. It is not a critical airfield and is used for flying training by National Flying Training Institute. The ATC is controlled by Airports Authority of India. As per the electronic Aeronautical Information Publication (e-AIP) of Gondia Airport, declared distances for RWY are as under:

RWY Designation	**Code**	**Elevation**	**TORA(M)**	**TODA(M)**	**ASDA(M)**	**LDA (M)**
04	4C	987ft/301m	2290	2290	2290	2135
22	4C	987ft/301m	2290	2290	2290	2155

1.11 **Flight Recorders:**

The aircraft is not equipped with Cockpit Voice Recording facility. However, aircraft is equipped with a flight recorder of make Garmin G1000 (Part No. BE0919411759B) with 2GB Sandisk SD card for storage.

FDR of the incident sortie was downloaded and it was analyzed. The radio altitude parameter is not recorded in the flight recorder. Hence the information and the analysis is based on the recorded pressure altitude Above Mean Sea Level.

During the first circuit, the aircraft made a stabilized approach and as advised by his instructor before the sortie, the student pilot executed an intentional go around at around 1150ft AMSL. The first approach and go around was uneventful. The aircraft then went up to almost 2200ft AMSL and then initiated the second approach for the full stop landing. The heading of the aircraft was 220 degrees. The observations made from the recorded parameters of the second approach are:-

(a) Approach Profile (Second approach):

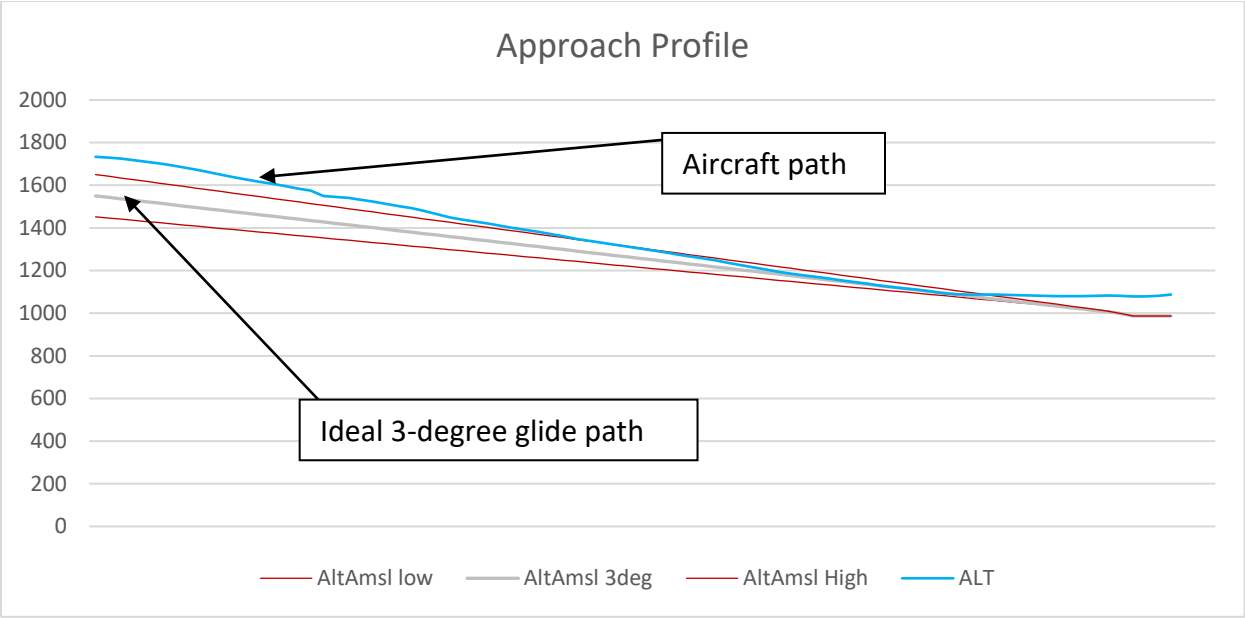

Fig.6.Approach profile of the aircraft (blue line)

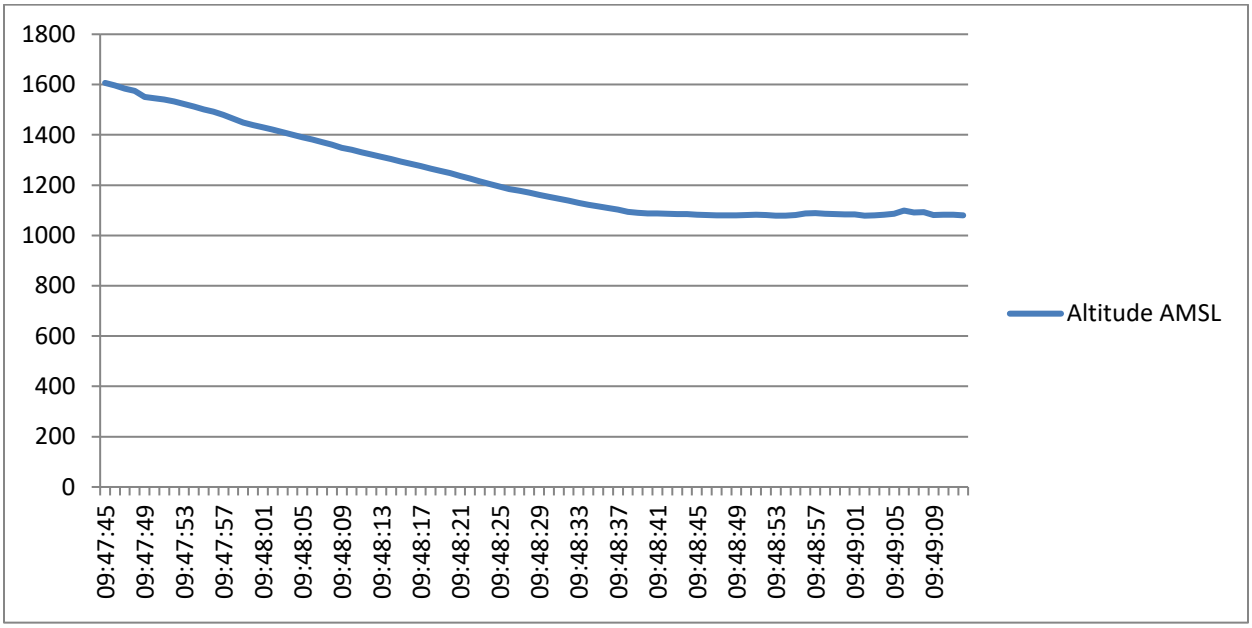

Fig.7. Altitude (AMSL) ft variation of the aircraft w.r.t time

In fig.6 & 7, the vertical axis is altitude Above Mean Sea Level (AMSL). In fig.6, the grey line shows the ideal 3-degree glide path, with red lines as tolerance limits (plus/minus 0.5 degrees) for a stabilized approach. The blue line is the actual path followed by the aircraft VT-NFK during the second approach. In this case, it is clear from the comparison that the initial phase of approach was above the tolerance values of glide path. The student pilot

brought the aircraft within the glide path limits at around 1200ft above mean sea level only. The approach was not stabilized on the glide path till very short finals.

(b) Approach Speed:

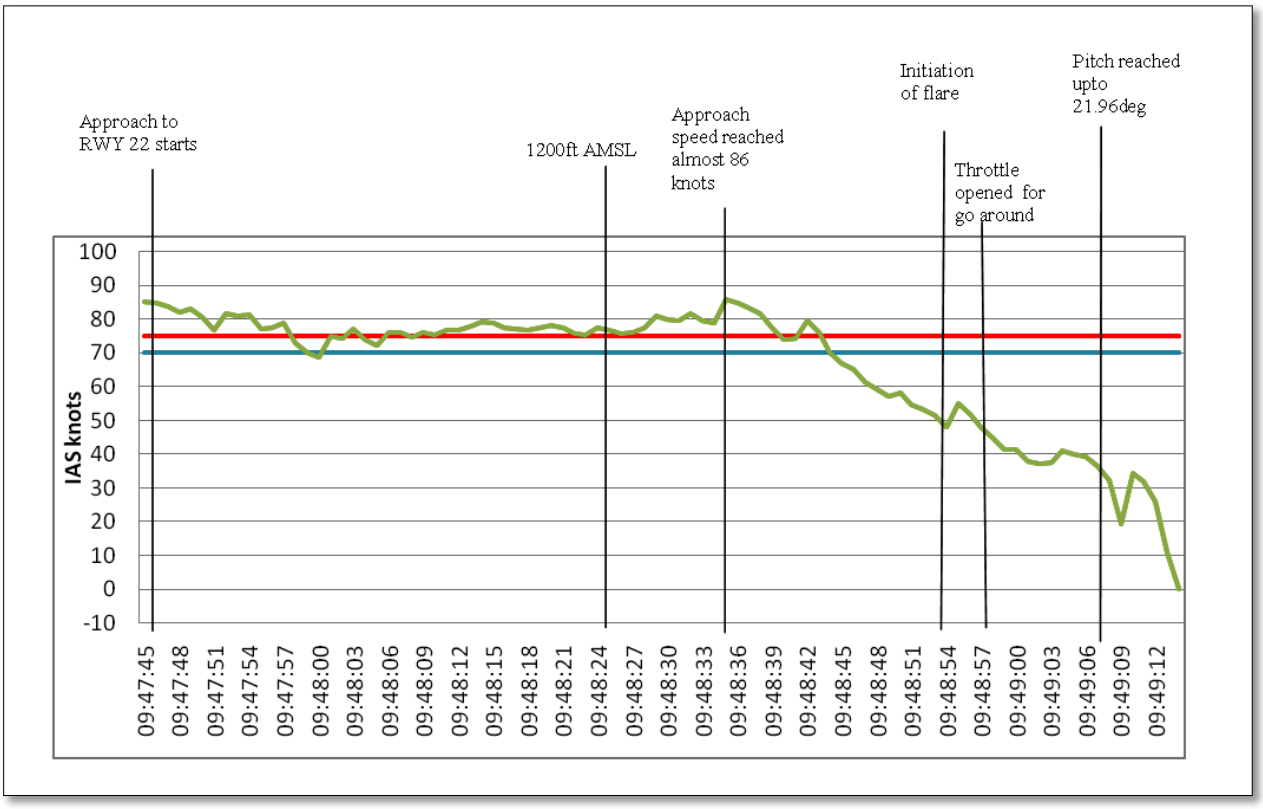

Fig.8.Approach speed of the aircraft

In fig.8, the vertical axis shows the approach speed (IAS) in kts against the time during the second approach (in UTC). The red and the blue lines are the tolerances levels (75 and 70 kts respectively) considering the normal operating airspeed procedures as per Aircraft Flight Manual. The green profile shows the actual approach speed of the aircraft.

It can be seen from fig.8 that the aircraft had a higher speed in the initial stage of approach, higher than the limits. The speed was then controlled for a limited period but went above the limits again. There was a spike in the Indicated Air Speed (IAS) to about 86 kts on short finals. The IAS of the aircraft at the time of initiation of flaring was around 51kts. The variation in the IAS of the aircraft also reflects that the approach was not stabilized.

(c) Pitch Attitude:

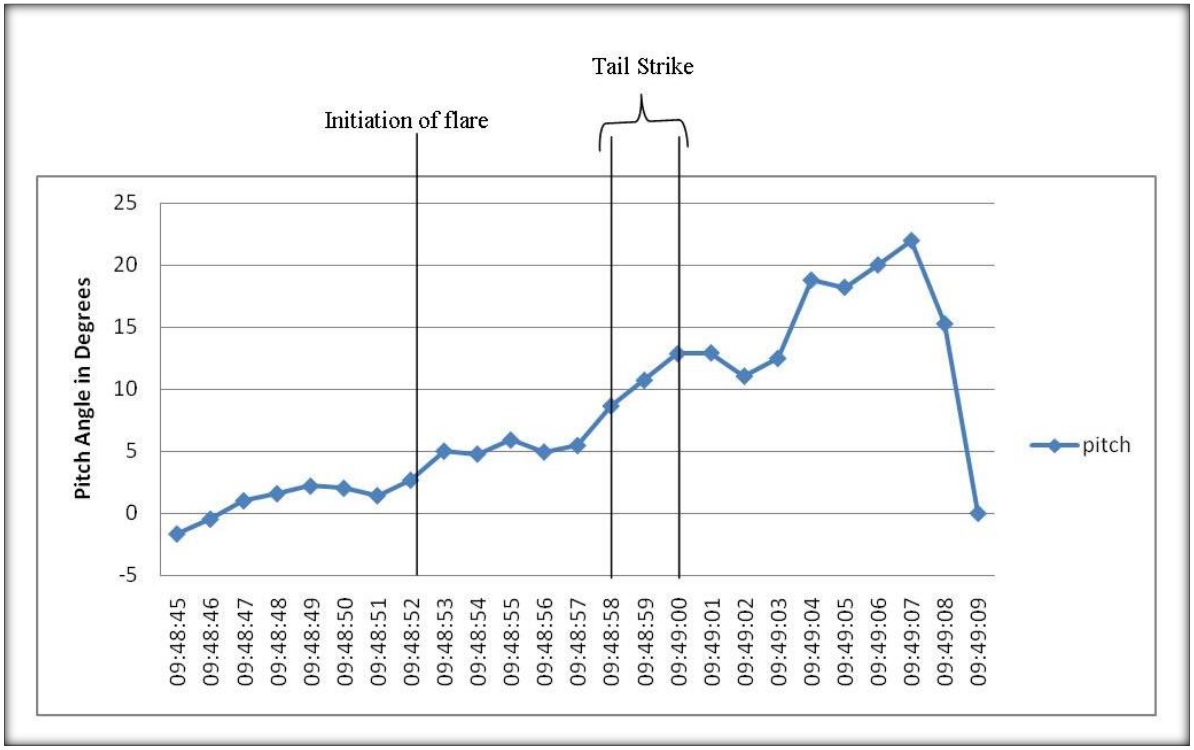

Fig.9.Pitch attitude of the aircraft w.r.t time

The above graph (Fig.9) is a representation of the pitch attitude during flare and touchdown phase. The blue line represents the variation of pitch attitude in degrees. As per the recordings, the pitch angle starts to move from negative value to greater than zero at time 094846 UTC at which the aircraft is at a height of 1081ft AMSL. The pitch attitude is seen varying for almost 7seconds from 094846 UTC. A sudden increase in the pitch value from 2.67 degrees to 5.1degrees in less than one second of time is observed at time 094852 UTC depicting flare. The pitch and the engine power kept on increasing thereafter. The pitch got increased from 5 degrees (at 094853 UTC) to 12 degrees (at 094900 UTC).

The pitch value at 094858 UTC was increasing from 8.64 degrees to 12degrees and it was the touchdown period followed by tail scrape. The aircraft started showing increase in banking attitude once the pitch value crossed 12 degrees. Aircraft altitude also raised simultaneously. The aircraft banked towards right (up to 8.26degrees) at time 094904UTC, during which the pitch value was 18.2degrees.The student pilot then reduced the power. The pitch angle kept on increasing and reached the highest recorded value of 21.96 degrees at time 094907UTC. At this point the aircraft had power ON stall with the wings banking towards left (bank angle of 21.03degrees) making a contact at the RWY surface. The aircraft came to a halt after 06 seconds from the moment wing tip touched on the ground. Some of the DFDR parameters showed erratic values after the stall.

(d) Vertical speed:

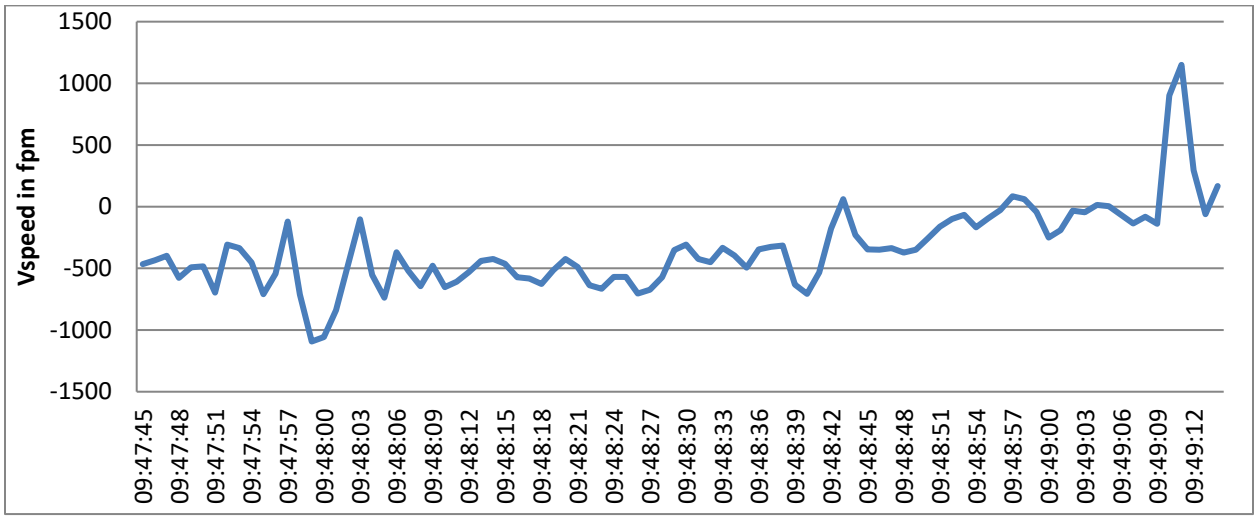

Fig.10. Vertical speed of the aircraft

It is understood from the variation in the normal acceleration values that the aircraft was not stabilized in second approach. Rise in the normal acceleration values during the flare indicates that the aircraft had a touchdown at around 094858 UTC followed by a bounce.

The above graph (Fig.10) shows how the vertical speed of the aircraft varied with time (in UTC). The sudden peak (towards the end) in vertical speed of approximately 1100 ft/ min is where the aircraft was at onset of stall which was followed by a sharp dip.

(e) Power management:

It can be seen from the parameters recorded that the engine power was getting reduced during the approach as the aircraft passed 1200ft AMSL. The engine rpm value was at idle when the aircraft initiated the flare. The increase in the rpm is visible at time 094857 UTC at which the pitch angle was increasing above 05 degrees. The engine power reached full throttle at around 0949 UTC.

(f) Wind / gust:

The DFDR was showing a wind value of approximately 3.9kts with wind direction of 40degrees. Considering this value, a tail wind of 3.9kts was acting at the time of landing.

Summary of FDR observations:

i. The student pilot made an overshooting approach during the second approach with a slightly high speed. He had maintained higher approach path for a long time and reduced it to come down on glide path only at 1200ft AMSL. The variation in the IAS and normal acceleration values of the aircraft reflects that the approach was not stabilized.

ii. The student pilot opened full throttle with pitch more than 5 degrees at low speed. The touchdown was associated with bounce and subsequently as the pitch attitude was increasing the aircraft had tail strike. Thereafter pitch attitude of the aircraft was continuously increased to about 21 degrees, and then the aircraft went into a full-power stall.

iii. FDR also shows a left turn and nose up pitch of nearly 21 degrees before impact.

1.12 **Wreckage and Impact Information:**

The second approach by the aircraft was made for RWY 22. The aircraft first came in contact with the RWY surface and then bounced in the air. Later, the aircraft touched with the left wing near the TWY B beginning making a scratch mark of length 19.7ft. The scratch was in an inclined path with one end at 82ft and another end at 86ft from the RWY centerline (Refer Fig12). There were four propeller strike marks on the TWY beginning after the wing tip scratch. (Refer Fig13).

Fig.11. Representation of various damages in aerial view

Fig.12. Left wing scrape mark

Fig.13. Propeller strike marks

It was followed by nose landing gear strut scrape mark of length 15ft (Refer Fig14). The scrape mark was 27.2 ft (on one edge) and 33.8 ft (on other edge) from the RWY 22 edge line. The right tire marking was seen near to the nose strut scrape mark. Tire path markings were also observed in the kutcha area (Fig 16).The aircraft finally stopped in the kutcha area making a rest in south- east direction near the drainage canal wall area as shown in Fig 16.

Fig.14. Nose strut scrape marks

The nose gear got disintegrated from the main aircraft body and found positioned at the TWY B shoulder area near the edge light (Refer Fig15). Few elastomers of the nose gear were found in the aircraft path on the kutcha area.

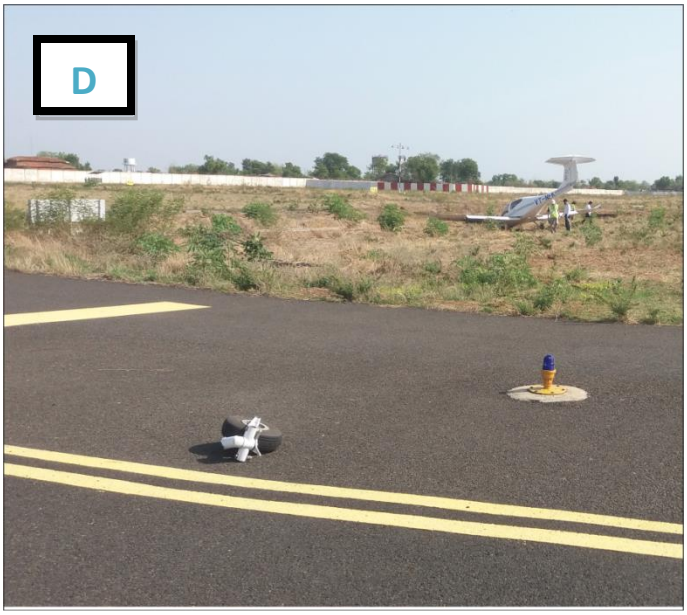

Fig.15. Detached nose gear and the aircraft

Aircraft final position was such that the RH landing gear was 145.6ft from RWY22 left edge line 175.3ft from TWY B centerline, whereas LH landing gear was 149ft from RWY22 left edge line and 167ft from TWY B centerline. (Refer Fig17)

Fig.16.Markings on kutcha area and aircraft final position.

The flap selection in the cockpit (in-situ) was found in landing configuration. After the incident, approximately 134.5litres of fuel was available in the fuel tank of the aircraft amounting to approximately 97.5kg. Hence aircraft landing weight was approximately 990.58kg which is well within the maximum aircraft landing weight of 1150kg. Approximately 02litres of fuel was drained out of the aircraft as sample for specification tests and the damaged aircraft was later shifted to the hangar area.

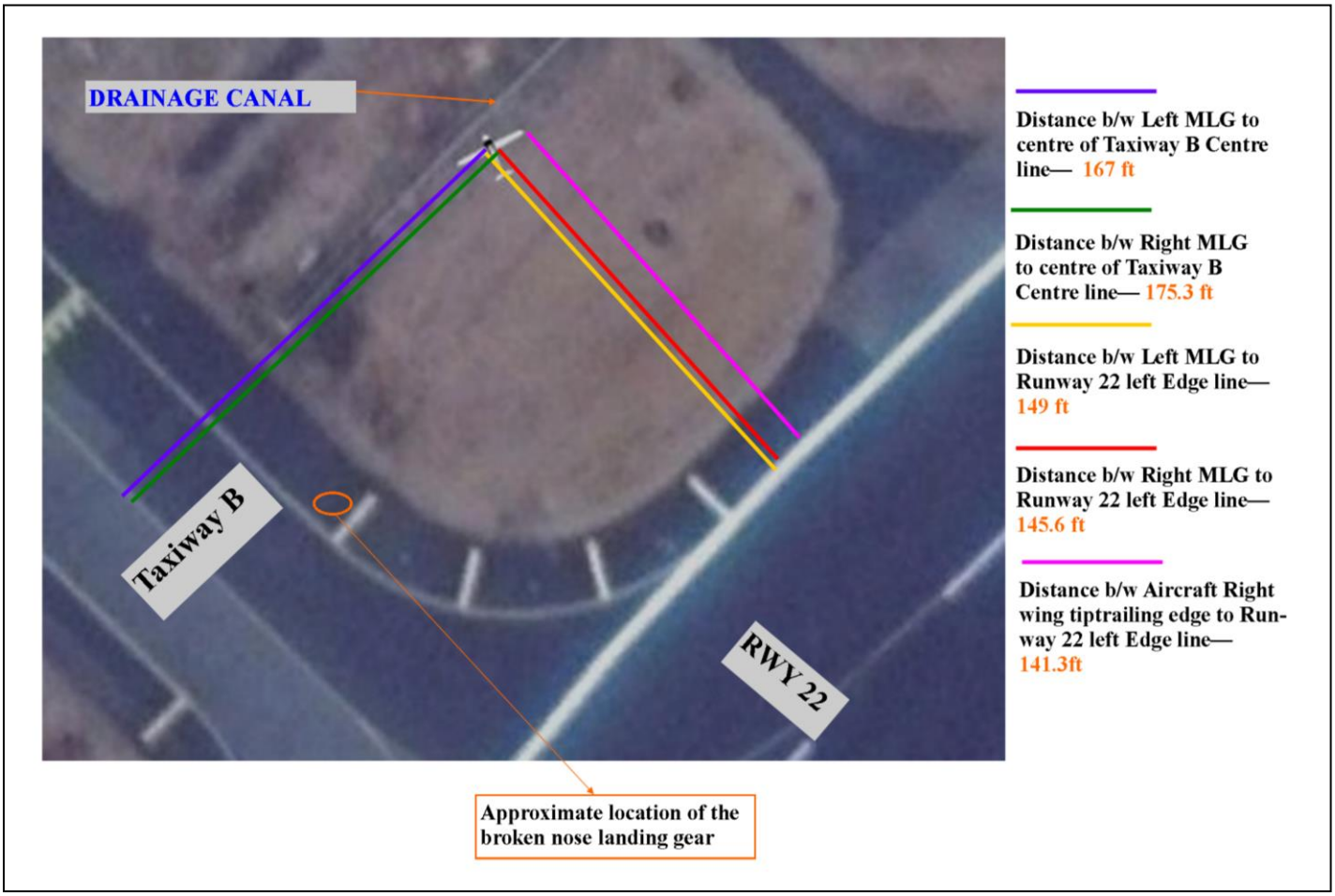

Fig.17.Aircraft position after coming to halt- aerial representation

1.13 **Medical and Pathological Information:**

There was no injury to the trainee pilot and no injury to any person on ground. The student pilot missed to carry out the Pre Flight Breathalyzer examination for consumption of alcohol before the sortie. But the same was marked as undergone in the Load and Trim performa by both the student pilot and his instructor.

However, the student pilot did undergo the Breathalyzer test post incident at 1025UTC using the instrument with Sl.no. P10000010 (last calibrated on 02.03.2017).The result of the test was negative.

1.14 **Fire:**

There was no fire or smoke before or after the incident.

1.15 **Survival Aspects:**

The aircraft during landing bounced and subsequently went into the kutcha area and stopped. The crash siren and fire alarm was activated by ATC and fire station was informed.

Ambulance and CFT reached the site however the student pilot came out of the aircraft unhurt on his own.

1.16 **Tests and Research:**

The fuel and oil sample collected from the incident aircraft was sent to The Physical and Chemical laboratory, Aircraft Engineering Directorate, O/o DGCA, New Delhi along with the specifications of the same. The samples were tested and found passed in the respective specification tests.

1.17 **Organizational and Management Information:**

National Flying Training Institute Pvt. Ltd., A joint venture of CAE Inc. and Airports Authority of India, is the flying training institute with an objective to impart pilot training to the student pilots. The Institute was setup at Gondia, Maharashtra in the year 2008. National Flying Training Institute Pvt. Ltd. is structured under the management of the Accountable Manager. NFTI was approved by DGCA to impart flying training to student pilots on DA40 and DA42 type of aircraft and the approval was valid on the date of incident.

NFTI has been established primarily to provide integrated flying and ground training to students towards obtaining the following Flying Licenses, Ratings and other flying qualifications:-

- Issue/Renewal/Extension of Student Pilot License & FRTOL(R)
- Issue/Renewal/Extension of Private Pilots Licenses (Aeroplane)
- Issue/Renewal/Extension of Commercial Pilots License (Aeroplane)
- Issue/Renewal/Extension of Airline Transport Pilots License(Aeroplane)
- Issue/Renewal/Extension of Instrument Rating on Single & Multiengineaircraft
- License Renewal & Foreign License Conversion Training
- Issue/Renewal of AFI Patter Training & Competency Checks
- Issue/Renewal of FI Patter Training & Competency Checks.

The Engineering setup at NFTI is under the approval system of DGCA and is an ”Approved Maintenance Organization” in CAR – M subpart ‘F’ and an approved “ Continuing Airworthiness Management Organization” under Subpart ‘G’ to cover maintenance and continuing airworthiness activities of aircraft, engine, instruments, radio communication, navigation equipment and battery installed on the aircraft operated by the Institute. NFTI uses DGCA approved Training and Procedure Manual for carrying out flying training.

1.18 **Additional Information:**

1.18.1 Bounced landing phenomenon

Bouncing During Touchdown: When the airplane contacts the ground with a sharp impact as the result of an improper attitude or an excessive rate of sink, it tends to "bounce" back into the air. Though the airplane's tires and shock struts provide some springing action, the

airplane does not bounce as does a rubber ball. Instead, it rebounds into the air because the wing's angle of attack was abruptly increased, producing a sudden addition of lift.

The abrupt change in angle of attack is the result of inertia instantly forcing the airplane's tail downward when the main wheels contact the ground sharply. The severity of the "bounce" depends on the airspeed at the moment of contact and the degree to which the angle of attack or pitch attitude was increased. Since a bounce occurs when the airplane makes contact with the ground before the proper touchdown attitude is attained, it is almost invariably accompanied by the application of excessive back elevator pressure. This is usually the result of the pilot realizing too late that the airplane is not in the proper attitude and attempting to establish it just as the second touchdown occurs.

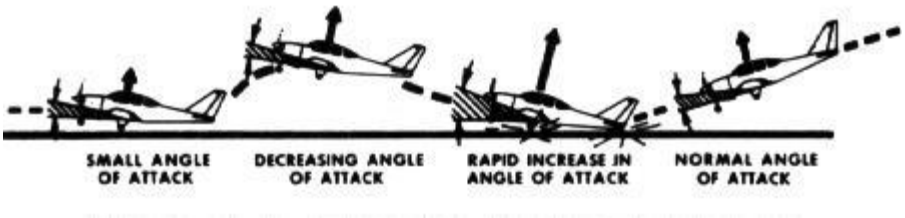

Fig.18. Bounced landing phenomenon

Recovery from bounce: The corrective action for a bounce is the same as for ballooning and similarly depends on its severity. When it is very slight and there is no extreme change in the airplane's pitch attitude, a follow-up landing may be executed by applying sufficient power to cushion the subsequent touchdown, and smoothly adjusting the pitch to the proper touchdown attitude. When a bounce is severe, the safest procedure is to EXECUTE A GO-AROUND IMMEDIATELY. Full power should be applied while simultaneously maintaining directional control and lowering the nose to a safe climb attitude. The go-around procedure should be continued even though the airplane may descend and another bounce may be encountered. It would be better to avoid an attempt for landing from a bad bounce since airspeed diminishes very rapidly in the nose high attitude and a stall may occur before a subsequent touchdown could be made.

1.18.2 Statement of witnesses:-

Dy.Chief Flight Instructor (witness#1) had authorized the sortie for the Student pilot on the incident date. According to the statement given by Dy.Chief Flight Instructor; as he was monitoring the Flight Operations in apron with one of Asst. Flight Instructor, he saw an A/C doing landing with high nose attitude and further adding power to do go-around. As per him, the A/C climbing attitude seemed too high and progressively left wing dropped with A/C stalled on the RWY.

As per the statement given by one of the flight instructors (witness#2) who was witnessing the landing; he was holding short of TWY D for sequence of departure after student pilot's landing. As seen from that position, the airspeed and approach attitude looked satisfactory, the student pilot during flare out maneuver did an early flare out, followed by which kept raising the aircraft nose whereby the tail initially impacted the ground after which student pilot opened power which lead to a power ON stall. As per him, due to insufficient rudder application, the aircraft swung to left and veered off the RWY.

As per ATC controller on duty (witness#3); he was on duty from 0935UTC to 1035UTC. As per him the visibility was 6KM and flight rule of VT-NFK was VFR. At 0936UTC VT-NFK requested ATC to join traffic circuit. VT-NFK was cleared to join traffic circuit RWY22 and traffic information was provided. After joining the traffic circuit, aircraft was cleared to descend to circuit altitude (2000ft). At 0942UTC VT-NFK reported on final RWY22 and requested for intentional Go-Around for training purpose. VT-NFK was cleared to practice Go around RWY22. After Go Around, following one circuit VT-NFK reported on final RWY 22 and requested for landing clearance at 0948 UTC and the landing clearance was provided. During the landing VT-NFK seemed to increase its speed and got imbalanced. Immediately crash siren and fire alarm was activated and informed to fire station and full emergency declared. Meanwhile aircraft VT-NFK swung off RWY towards left side between TWY B and service road.

1.18.3 ATC log book:-

As per ATC log book, VT-NFK, operator NFTI given landing clearance on RWY22, after landing aircraft was moving on RWY towards exit TWY, aircraft landed on RWY22 at 0949, till the time everything was okay, while moving towards exit TWY aircraft suddenly increased its speed, got imbalanced and swung off towards left of RWY22 between TXWY B and service road, aircraft nose wheel came out, propeller got bent. While aircraft got imbalanced on RWY, immediately crash siren and fire alarm pressed at 0949Z and full emergency declared, informed to fire station and ATS in-charge.

1.19 **Useful or Effective Investigation Techniques:**

The cameras installed on the ATC tower and apron which could be useful in analyzing the approach and landing techniques made by the student pilots were examined for the recordings. Out of all the serviceable cameras, camera #23 and camera #38 only had recorded the aircraft movement. On replaying the same, it was showing a distant view of the aircraft stalling with left wing drop attitude followed by an impact and veering towards the kutcha area.

2. ANALYSIS:

2.1 Operational aspects:

On the day of incident, student pilot was authorized by the Deputy Chief Flight Instructor for solo general flying (One intentional Go around followed by full stop landing). The student pilot had enough rest before the flight. The student pilot after finishing the documentation work, reached the aircraft for the preflight checks. As per the log book, the student pilot accepted the aircraft at 0815UTC.

After carrying out all the preflight checks he was cleared for line up and takeoff on RWY 22 at 0936UTC. After an uneventful takeoff, the performance of the aircraft was reported normal. Thereafter the student pilot reported on finals for RWY 22 and during the first approach he requested ATC permission for intentional Go around which the ATC permitted at 0942UTC. The student pilot did the Go around practice and climbed again. He made the required holding and then initiated the second approach for RWY22 for the full stop landing.

From the DFDR values it is established that the second approach was in a higher profile and was not stabilized. A higher approach path was maintained for a long time and reduced it to come down on glide path only at 1200ft AMSL. The approach speed was not maintained within the required limits and went up to 85kts at the beginning of approach. The speed was then controlled for a limited period but went above the limits again. The approach speed was having spikes even at last phases, reaching up to 86kts on short finals. There was a sudden rise in the rate of descent after the initiation of the flare which had resulted in the bounce of the aircraft. The student pilot continued to keep the pitch attitude increasing, reaching up to 12 degrees which resulted in building up of lift and subsequently ballooning of the aircraft took place. The pitch of the aircraft was more than 10 degrees during the ballooning (more than the tail strike limit) which resulted the tail to strike on the ground.

Once aircraft started ballooning, student pilot increased the power to initiate Go around. During that time, instead of maintaining the pitch attitude for Go around, he increased the pitch attitude of the aircraft further high. The flaps were not selected to Takeoff configuration as required for Go Around. The heading of the aircraft started varying towards left during this time. As the pitch attitude kept on increasing, the wing started rolling towards left. The roll was then maintained to right for few seconds. When the pitch angle reached up to 21degrees, the aircraft stalled and the wing rolled to left drastically and the left wing tip contacted the ground surface. Thereafter the propeller struck the ground followed by the nose wheel impact. Due to the sudden impact, the nose landing

gear got detached from the strut. The aircraft continued to move towards left scraping with the broken end of the nose strut on the surface of the Runway-Taxiway B joining. The aircraft eventually went out of the RWY in between two edge lights on TWY B.

From the DFDR analysis, the student pilot's statement regarding the stable approach is not justified. It is evident that aircraft handling by the student pilot was the prime factor to the incident.

2.2 Engineering aspects:

All the maintenance/airworthiness documents pertaining to the aircraft VT-NFK was valid at the time of incident. No scheduled inspection was found due on the aircraft before the incident flight. The engine run up and the daily inspection as per schedule performed by Engineer was found satisfactory. There were no snags reported by the crew who operated before the incident sortie and no snag was pending for rectification before the incident sortie. Also no MEL was invoked and no DGCA mandatory modification was due on this aircraft at the time of incident. The weight of the aircraft at the time of take-off was 1029.38 Kgs which included 136.3 Kgs of fuel against the MAUW of 1200 Kgs. From the calculation of the remaining fuel available after the incident, it was confirmed that the actual landing weight of the aircraft was within the Maximum Landing Weight. The fuel and oil samples were within the specification criteria.

Therefore, the aircraft was considered airworthy before the incident flight and the maintenance factor is ruled out.

2.3 Weather aspects:

The incident occurred in day time with visibility of 6000m. The weather reported by the ATC to the student pilot was 'CALM'. The records available in METAR register also shows that the weather parameters were suitable for general flying. As per METAR records, the winds for UTC0950 were 180/05kts. Considering the wind component, the crosswind factor for RWY22 is 03kts from left. The DFDR was showing a wind value of approximately 3.9kts with wind direction of 40degrees (tail wind) which is considerably a low value.

Hence, weather is not considered a factor to the incident.

2.4 Circumstances leading to the Incident:

The aircraft was serviceable and no defect was reported on the aircraft by the pilot prior or after the incident. The aircraft had two other satisfactory sorties before the incident flight performed by other crew, and thus not the first flight of the day. At the time of incident weather reported was calm.

The second approach made by the student pilot was high in the beginning. The student pilot managed to bring the aircraft to stabilized path at around 1200ftAMSL which was very late. The speed was also high at many times during approach even at the finals. Student pilot did not control pitch attitude during flare out. The aircraft thereafter had a sudden spike in the vertical speed causing the aircraft to bounce. The student pilot instead of managing the pitch, kept on raising it and this caused the aircraft to balloon thereafter with a tail strike.

As the student pilot felt the ballooning unstable, he increased the power to FULL to initiate Go around. The flaps were not selected to Takeoff configuration as required for Go Around. For going around he pulled back the control lever very high making aircraft to pitch up further resulting in power ON stall. Subsequently, as a result of stall the aircraft rolled towards left and the left wing tip contacted the Runway -Taxiway B surface and propeller struck on RWY edge surface many times. Thereafter the aircraft had a nose wheel impact causing the nose landing gear to detach from the strut. The aircraft continued to move left scraping the surface of the Runway-Taxiway B joining with the broken end of nose strut. The aircraft eventually went out of the RWY in between two edge lights on TWY B, and stopped approx. 150 feet left from the RWY 22 edge in the kutcha area close to drainage canal.

3. CONCLUSION:

3.1 Findings:

i. Aircraft was found airworthy at the time of incident. This aircraft had flown two other sorties on the same day prior to the incident sortie and no snags were reported. The maintenance factor was not a contributory factor to the incident.

ii. Student pilot had a valid license to fly the aircraft and his medical was also valid at the time of incident. The student pilot was current on flying training on Diamond DA-40 aircraft.

iii. On the day of incident, the student pilot was authorized by Dy.CFI to carry out solo general flying including intentional Go around followed by full stop landing. The takeoff, first approach and go around carried out by the student pilot was uneventful.

iv. The student pilot did not carry out the mandatory Breath Analyzer test for consumption of alcohol before the flight. However, Post incident Breath Analyzer test was carried out and the result was negative.

v. There was sufficient quantity of fuel and oil in the respective tanks. The fuel and oil used were of correct specifications. The landing weight of the aircraft was within the Maximum Aircraft Landing weight of 1150 kg.

vi. At the time of incident, weather reported was fine with winds calm and visibility 6000m. The weather was not a contributory factor to the incident.

vii. The early phase of the second approach made by the student pilot was high. The speed at which the approach was made was also unstable and high. The second approach made by the student pilot was not stabilized.

viii. The flaring was held with higher pitch attitude causing an increase in the vertical speed (rate of descent) of the aircraft resulting in the bounce.

ix. During the bounce the student pilot kept on increasing the pitch and this caused the aircraft tail to touch on ground.

x. The bounce recovery technique used by the student pilot i.e action for Go around was made with high control lever input for pitch, which caused the aircraft to nose up further more. This resulted an increase in resistance to the aircraft (drag) and eventually led the aircraft to a power ON stall.

xi. As a result of stall, the aircraft started banking and the left wing tip drooped down and contacted the Runway -Taxiway B surface. Thereafter the aircraft had few propeller strikes on ground. The nose wheel got detached from the strut during the sudden impact and the aircraft continued to move towards left side of the RWY with the broken end of strut scraping the ground surface.

xii. There was no injury to the student pilot. He came out of the aircraft unhurt. There was no injury to any other person outside the aircraft.

xiii. The damages to the runway –taxiway surface was due to the wing tip, propeller and nose strut strike. There was no fire or smoke from the aircraft.

3.2 Probable Cause:

The improper flare and the bounce recovery technique was the probable cause of the incident.

4. SAFETY RECOMMENDATIONS:

- Action as deemed fit by DGCA-Hqrs in view of the above findings.

VINEETH S

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Date: 19.10.2020 (Vineeth S)
Place: Mumbai Inquiry Officer, VT-NFK

----End of report—