

FINAL INVESTIGATION REPORT OF SERIOUS INCIDENT TO
M/s INDIRA GANDHI RASHTRIYA URAN AKADEMI , DA-40 AIRCRAFT
VT-FGA ON 03.07.2015 AT FURSATGANJ, AMETHI, UP.

Office of Director of Air Safety (NR)
Civil Aviation Department
Safdarjung Airport, New Delhi-110003.

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Abbreviations Used

Abbreviations	Expansion
ATC	Air Traffic Control Tower
ATF	Aviation Turbine Fuel
CFI	Chief Flight Instructor
CRS	Certificate of release to service
Capt.	Captain
DME	Distance Measuring Equipment
DVOR	Doppler Very High Frequency Omni Range
FTPR	Flying Training Progress Record
hrs	Hours
IAS	Indicated Air Speed
IGRUA	Indira Gandhi Rashtriya Uran Akedemy
IMD	India Meteorological Department
IST	Indian Standard Time
PAPI	Precision Approach Position Indicator
PCN	Pavement Classification Number
PIO	Pilot Induced Oscillation
QFE	Quasi Field Elevation
QNH	Quasi Nautical Height (Altitude above mean sea level).
SPL	Student Pilot License
VHF	Very High Frequency
TPM	Training and Procedure Manual
TSN	Time since new
TSO	Time since overhaul
Z	Zulu time or GMT Time
°C	Degree Celsius

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VT-FGA ON 03.07.2015 AT FURSATGANJ, AMETHI, UP.

1	Aircraft	Type	DA-40
		Nationality	Indian
		Registration	VT-FGA
2	Owner and Operator	INDIRA GANDHI RASHTRIYA URAN AKADEMI, Safdarjung Airport, New Delhi - 110003	
3	Pilot – in –Command	IGRUA SPL	
	Extent of injuries	Nil	
4	Date & Time of Incident	03.07.2015; 1651 IST.	
5	Place of Incident	Fursatganj Airfield, Amethi, U.P.	
6	Co-ordinates of Incident site	Latitude	26 ° 14 ' 57.22 " N
		Longitude	81 ° 22 ' 54.12 " E
7	Last point of Departure	Fursatganj Airfield , Amethi, U.P	
8	Intended place of landing	Fursatganj Airfield, Amethi, U.P	
9	No. of Persons on board	01	
10	Type of Operation	Flying Training	
11	Phase of Operation	Landing	
12	Type of Incident	Pilot Induced Oscillations after touchdown.	

(All timings in the report are in IST)

SYNOPSIS:

Flight cadet (SPL holder) was authorised for a local flying (solo sortie) near Fursatganj airfield of 'Indira Gandhi Rashtriya Uran Akademi' on 03.07.2015 in DA-40 aircraft, registration VT-FGA. The flight cadet took-off at 1602 IST. After general flying in the allocated sector, she

re-joined the circuit. On first approach, she made an intentional 'Go-Around' as briefed. There after she made a second approach and touched down for landing. During landing roll, the aircraft entered into 'Pilot Induced Oscillations' and bounced several times. During these bounces, both propeller blades of the single engine aircraft struck the runway and got damaged. Nose landing gear strut, bottom surfaces of right wing tip and tail boom of the aircraft were also damaged. After the bounces diminished, the aircraft veered towards right edge of the runway. The flight cadet steered the aircraft towards center line of the runway and stopped it and came out unhurt. The incident occurred at 1651 IST. Weather was fine at the time of the incident.

In view of the incident, the Director General of Civil Aviation instituted an investigation into facts and circumstances of the incident to ascertain the cause of the incident by appointing Inquiry Officer vide Order No. AV 15019/53/2015-AS dated 10.07.2015 under Rule 13(1) of Aircraft (Investigation of Accidents and Incidents), Rules 2012.

On conclusion of investigation of the incident, it was found that the incident occurred during landing due non-adherence of laid down procedures by the flight cadet.

1. FACTUAL INFORMATION:

1.1 History of Flight:

1.1.1. On 03.07.2015, a 'solo flying training' in local area over Fursatganj Airfield was planned for the flight cadet on DA-40 aircraft registration VT-FGA. The Aircraft Maintenance Engineer (AME) carried out Daily Inspection of the aircraft VT-FGA as per the approved schedule at 0750 IST. There was 152 litres of fuel and 07 litres of oil on board the DA-40 aircraft VT-FGA before the sortie. There was no snag reported on the aircraft. Certificate of Release to Service (CRS) was also issued in the morning of 03.07.2015.

1.1.2. The flight cadet was authorized for a general solo flying training in the aircraft VT-FGA near Fursatganj airfield of IGRUA in Amethi district of Uttar Pradesh. Departure and destination runway was Fursatganj airfield, Amethi itself. Visibility prevailing was 5000 meters and there was no rain. After pre-flight inspection, the flight cadet departed at 1602 IST as 'pilot-in-command' for flight training. After general flying in the local area, the flight cadet rejoined the circuit. On first approach for runway 27 of the airfield, the flight cadet carried out

an intentional 'Go Around' as briefed. During the second approach to land, after flare out the aircraft touched runway surface and bounced. There were seven successive bounces thereafter. The amplitude of bounces increased successively from first bounce to the fifth bounce. During fourth, fifth and sixth bounce, propeller strikes occurred on the runway. Also during fifth bounce, tail strike occurred. After seventh bounce, right wing strike occurred and propeller stopped rotating. The amplitude of the seventh bounce was very less. Speed of the aircraft became very low after the seventh bounce. The aircraft veered towards right edge of the runway. However, the flight cadet steered the aircraft towards the center line of the runway and brought it to a halt and came out unhurt. The aircraft was then towed to a hangar.

1.1.3. The incident occurred during day time at 1651 IST (local time) at Fursatganj airfield, Amethi, Latitude: 26 ° 14 ' 57.22 " North & Longitude: 81 ° 22 ' 54.12 " East. Elevation of the airfield is 110.39 meters (362 feet).

1.1.4. The flight cadet had, earlier, flown a sortie of 01 hour 10 minutes duration with Chief Flight Instructor in the morning of 03.07.2015 before the incident flight. The sortie was uneventful. She flew the incident flight in the afternoon of 03.07.2015.

1.2 Injuries to Persons :

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

1.3 Damage to aircraft: Damage to the aircraft was substantial.

1.4 Other damages: There was slight damage to the runway surface due to propeller strikes. There was no other damage.

1.5. Personnel information: (Pilot- in- Command):

1.5.1. Age	: 19 years, Female
License	: Student Pilot License: IGRUA
Date of Issue	: 14.01.2015
Valid up to	: 13.01.2020
Category	: Aeroplane
Date of Class I/ Med. Exam.	: 20.05.2015
Class I Medical Valid up to	: 19.05.2016
Date of issue FRTOL License	: 17.02.2015
IR rating and instructor rating	: Nil
FRTO License Valid up to	: 16.02.2025
Total flying experience {on type}	: 64hours (DA-40 aircraft)
Total flying experience during last 1 year	: 64 hours
Total flying experience during last 6 Months:	64 hours
Total flying experience as Pilot-in Command:	21 hours 35 minutes
Total flying experience during last 30 days	: 14 hours 20 minutes
Total flying experience during last 07 Days	: 02 hours 10 minutes
Total flying experience during last 24 Hours	: 01 hours 10 minutes
Duty time in last 24hrs	: Nil (Student Pilot)
Rest before the flight	: 06 days (before 03.07.2015).

1.5.2. The flight cadet was examined for consumption of alcohol and fitness for flying in the morning of 03.07.2015. She was found fit for flying.

1.5.3. The flight cadet was evaluated after completion of 15 hours of her initial dual flying training for clearing her for solo flying. On evaluation, it was decided by Chief Flight Instructor to impart her two hours of additional flying training; termed as 'Flex Sorties'. On completion of 'Flex Sorties', she was evaluated again. Additional flying training was extended by one more hour by the Chief Flight Instructor. She was, thereafter, evaluated by the Chief Flight Instructor and found to have acquired the required standards and was cleared for 'solo flying'. She flew her first solo after 21 hours of her dual flying training.

1.6. Aircraft Information:

1.6.1 Aircraft: The aircraft is owned and operated by Indira Gandhi Rashtriya Uran Akademi, Safdarjung Airport, New Delhi-110003. The Diamond DA-40 aircraft, serial number 40.987 was manufactured in the year 2008 in Canada. The aircraft was registered as VT-FGA on 21.07.2009 in Indian Civil Aircraft Register. The Certificate of Airworthiness No. 6085 was initially issued on 03.08.2009 and was valid up to 30.03.2019. The aircraft has completed 5056:41 hours since new till the time of the incident. Its Airworthiness Review Certificate (ARC) is valid up to 09.04.2016. The aircraft has all up weight of 1200 kg. Minimum one flight crew is required to operate the aircraft.

1.6.2. Engine: The aircraft is fitted with single piston engine. Engine Type is Lycoming. Engine Model is LYCO IO.360 M1A. Its serial No. is L-34558:51E. It was installed on the aircraft on 16.12.2013. The engine has logged a total of 3068:10 hours since new (TSN). Date of last engine overhaul is 05.04.2013 and it has completed 1068:40 hours since last overhaul (TSO).

1.6.3. Propeller: The single piston engine is equipped with two Hartzell propellers blades, model HC-C2YR-1BFP, Sl. No. CH-44141 B. The propellers have completed 3979:24 hours since new (TSN) and 1590:25 hours since last overhaul (TSO).

1.6.4. Type of landing gear: The aircraft is equipped with tricycle type fixed undercarriage.

1.6.5. Part/component failed history if any: No components or part had failed or malfunctioned during the flight.

1.6.6. Last Maintenance: Last maintenance carried out on the aircraft was 50 hours/3 months approved inspection schedule on 30.06.2015 at 5035:05 hours TSN. Next servicing was due at 100 hours/06 months at 5085:05 hours TSN on 30.09.2015. No modification was due on the aircraft on the date of incident.

1.6.7. Performance: There was no snag pertaining to control surfaces. Weight of the aircraft at the time of take-off was 998.7 kg (approx.). Centre of Gravity was within limit.

1.6.8. Type of fuel used: AVGAS 100LL is the fuel used for the aircraft. There was no warning related to fuel or oil system. After landing, 125 litres of fuel and 07 litres of oil was left over on board the aircraft.

1.6.9. Meteorological Information: Meteorological information is provided by India Meteorological Department (IMD) to Indira Gandhi Rashtriya Uran Akademi, Fursatganj Airfield, Amethi on hourly basis. Meteorological Report issued by IMD for IGRUA (Fursatganj) at 1530 IST (1000 Z) is given below:-

Visibility : 5000 metres, Weather : Haze, Wind : 270/03 KT
Clouds : FEW 2000 feet (600 metres), SCT 2500 feet (750 metres),
FEW 030 CB 3000 feet (900 metres), T : 38°C, DP 23 °C, QNH 0997 hPa, 2945 INS
QFE 0985 hPa, 2909 INS

Meteorological Report was available to the crew for meteorological briefing before the flight. The weather conditions were conducive for flying under Visual Flight Rules. Meteorological Report issued by IMD for IGRUA (Fursatganj, Amethi) at 1630 IST (1100Z) is given below:-

Visibility: 4000 metres, Weather: Haze, Wind : VRB/02KT, Clouds : FEW 2000 feet
(600 metres), T : 38 °C, DP 23 °C, QNH 0996 hPa , 2944 INS, QFE 0984 hPa, 2907 INS.

Actual weather was the same as forecasted above for Fursatganj Airfield. As the aircraft was flying in the locality of the Fursatganj Airfield; meteorological forecast were valid and applicable to the flight of the aircraft.

1.7 .Aids to Navigation:

DVOR and DME (high power) is available and co-located at the airfield for navigational guidance to aircraft. ILS (Localizer and Glide Path) is also available for providing Instrument Landing System facilities for landing of aircraft. A DME (Low Power) is co-located with Glide Path Antenna to provide distance information to the pilot while the aircraft is making an instrument approach. Other visual aids on ground for landing include Wind Shocks, Precision Approach Position Indicator (PAPI) and Aerodrome Beacon light. PAPI provides visual guidance for a 3 ° Glide Path. Aircraft is equipped with receivers for DVOR and DME for facilitating navigation. However , in this case, the aircraft was flying under visual flight rules

in the vicinity of Fursatganj airfield (local flying) and navigational aids were not used by the flight cadet.

1.8. Communication:

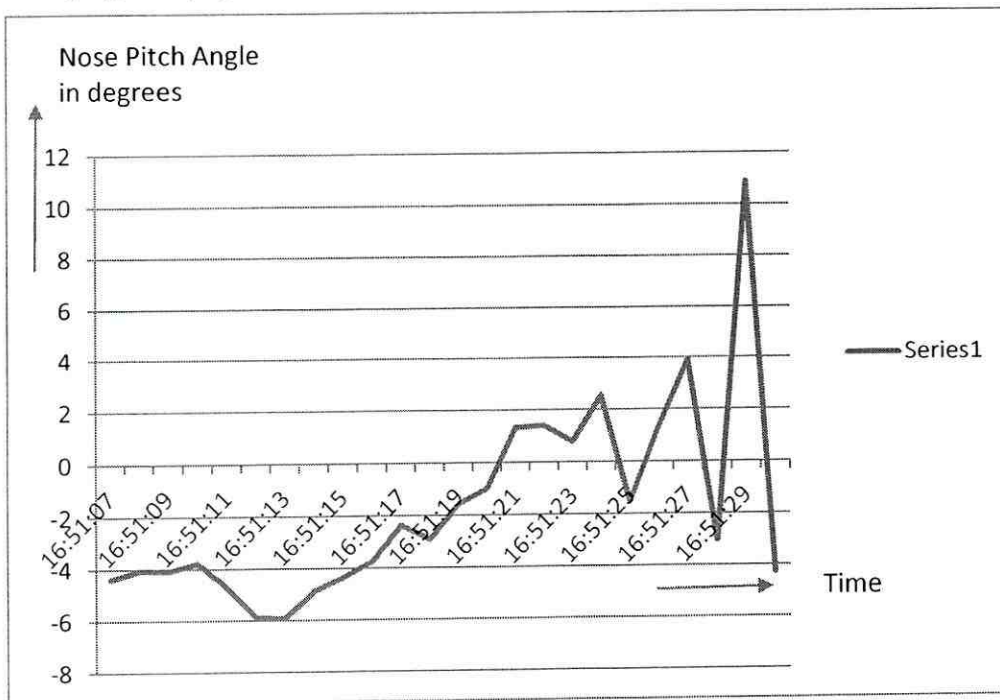
The aircraft is equipped with Very High Frequency (VHF) radio telephony. ATC at Fursatganj is also equipped with Very High Frequency (VHF) radio telephony. Two way communication between the aircraft and ATC was established. The aircraft was cleared for landing by ATC at 1644 IST (1114 Z) which was also the last communication between the aircraft and ATC. There was no snag in communication system of either with the aircraft or with the ATC.

1.9 Aerodrome information:

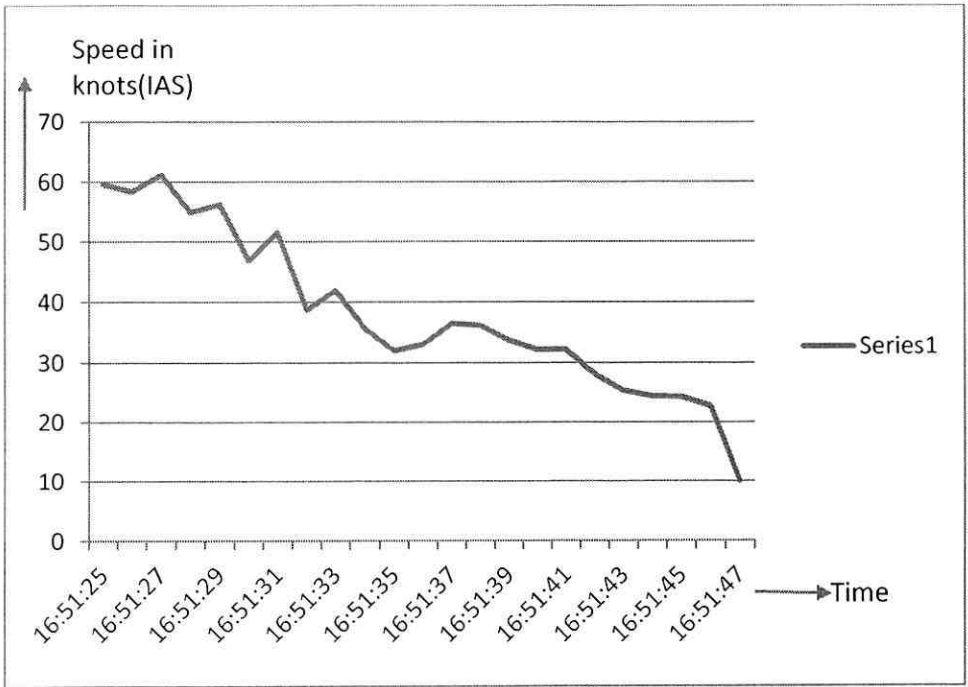
Fursatganj Airfield is located in Amethi district of Uttar Pradesh. Airfield Reference Point coordinates are :Latitude 26 ° 14 ' 57.22 " N & Longitude 81 ° 22 ' 54.12 " E. Its elevation is 362 feet(110.39 meters). Runway orientation at the airfield are 09 & 27. Length and breadth of the runway is 1839 meters and 45 meters respectively. Airfield code is 'VIRB'. Runway is made up of concrete with bitumen layers on its surface. PCN value for the runway surface is not determined. There are no restriction with respect to threshold. Complete runway length is available for take-off and landing. Visual aids like PAPI lights , wind shocks and Aerodrome beacon lights are available. Besides, high intensity runway lights are available (without approach lights) for night landing facility. The airfield is equipped with DVOR and DME for providing direction and distance guidance for arriving and departing aircraft. Instrument Landing System (ILS) is also available to enable aircraft make precision approach on runway for landing. ATC is equipped with VHF RT. Two way uninterrupted communication is available between ATC and aircraft. Meteorological services in the form of 'METEOROLOGICAL REPORT' or 'METAR' are provided by India Meteorological Department (IMD) on hourly basis. Fire Safety Services of Category -IV are available for provision during ATC watch hours. No Aviation Turbine Fuel (ATF) refueling facility is available on the airfield. Only limited AVGAS 100 LL is available on request. Airspace around Fursatganj Airfield is classified as 'Class-D' airspace. It is not a critical airfield and is used for flying training by Indira Gandhi Rashtriya Uran Akademi, Fursatganj, Amethi, Uttar Pradesh.

1.10 Flight recorders :

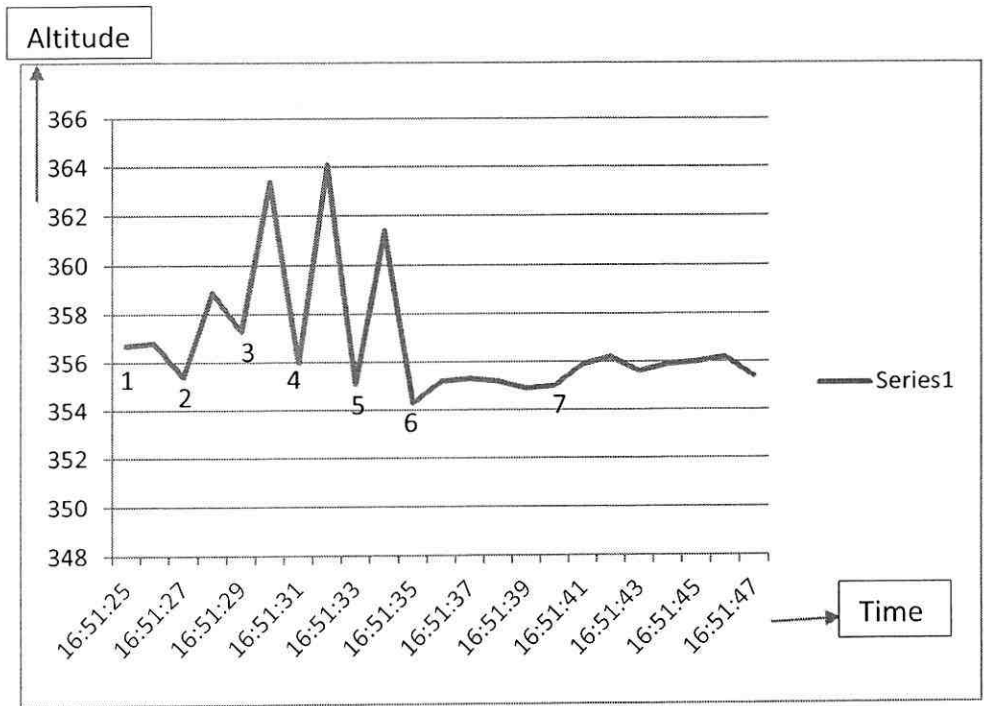
The aircraft is equipped with Garmin 1000 Integrated Avionics System. This Integrated Avionics System has 'built-in' provision for recording flight data in a SD (San Disk) card. The SD Card is mounted in the top slot of Multi Function Display (MFD) unit. The flight data recorded in the SD card can be downloaded using a 'SD card reader' in a personal computer. The flight data so downloaded can be viewed in Microsoft Office Excel format. The Integrated Avionics System records around 25 parameters pertaining to a flight of the aircraft which can be monitored after every sortie. Basic parameters like Indicated Air Speed, Altitude, Pitch, Ground Speed, Vertical Speed, etc. are included among the parameters. The flight data such as aircraft roll, pitch and speed recorded in the 'integrated avionics system' during approach phase indicate that approach was fairly stable. Flare was very short. Aircraft touched down around 16:51:23 hours. At the time of touch down, the aircraft speed was below 70 knots (IAS). The best speed to glide for this aircraft is between 60 to 68 knots (IAS). Pitch values show that aircraft nose pitch was about 1° before touch down. That is, nose was pitching almost horizontal at the time of touch down. After touch down, nose pitch values are found to be changing abruptly.



Nose Pitch Angle versus time graph during touch down and landing.



Speed versus Time graph of landing roll.



Altitude versus Time graph of landing roll.

(Kinks in the graphs show bounces from 1 to 7)

After touch down, aircraft speed can be seen reducing with successive bounces. Also change in altitude values can be seen after touchdown, which correspond to bounces.

1.11 Wreckage & impact information :

The aircraft made an approach from runway 27 end, and touched down abeam taxi way 'D'. Camera recording shows that after touch down the aircraft bounced seven times. During fourth, fifth and sixth bounce propeller strike occurred. During fifth bounce tail strike occurred. After the seventh bounce, the aircraft right hand side wing tip touched the runway and speed decreased considerably. The first strike of propeller (during fourth bounce) was at a distance of 111 metres (approx..) from the beginning of taxiway 'D'. Second propeller strike marks appeared (during fifth bounce) at a distance of 56 metres (approx..) from the previous propeller strikes. Third propeller strikes occurred (during sixth bounce) at a distance of 56.3 metres from the immediate previous propeller strikes. After seventh bounce, the propeller stopped rotating. The aircraft veered towards right edge of the runway and was steered by the flight cadet towards the center line of the runway and brought to a halt. The aircraft stopped at 280 meters (approx..) from touch down. There was no malfunction of any aircraft components including brakes. No parts or components of the aircraft got detached from the aircraft. Damage details are given below:

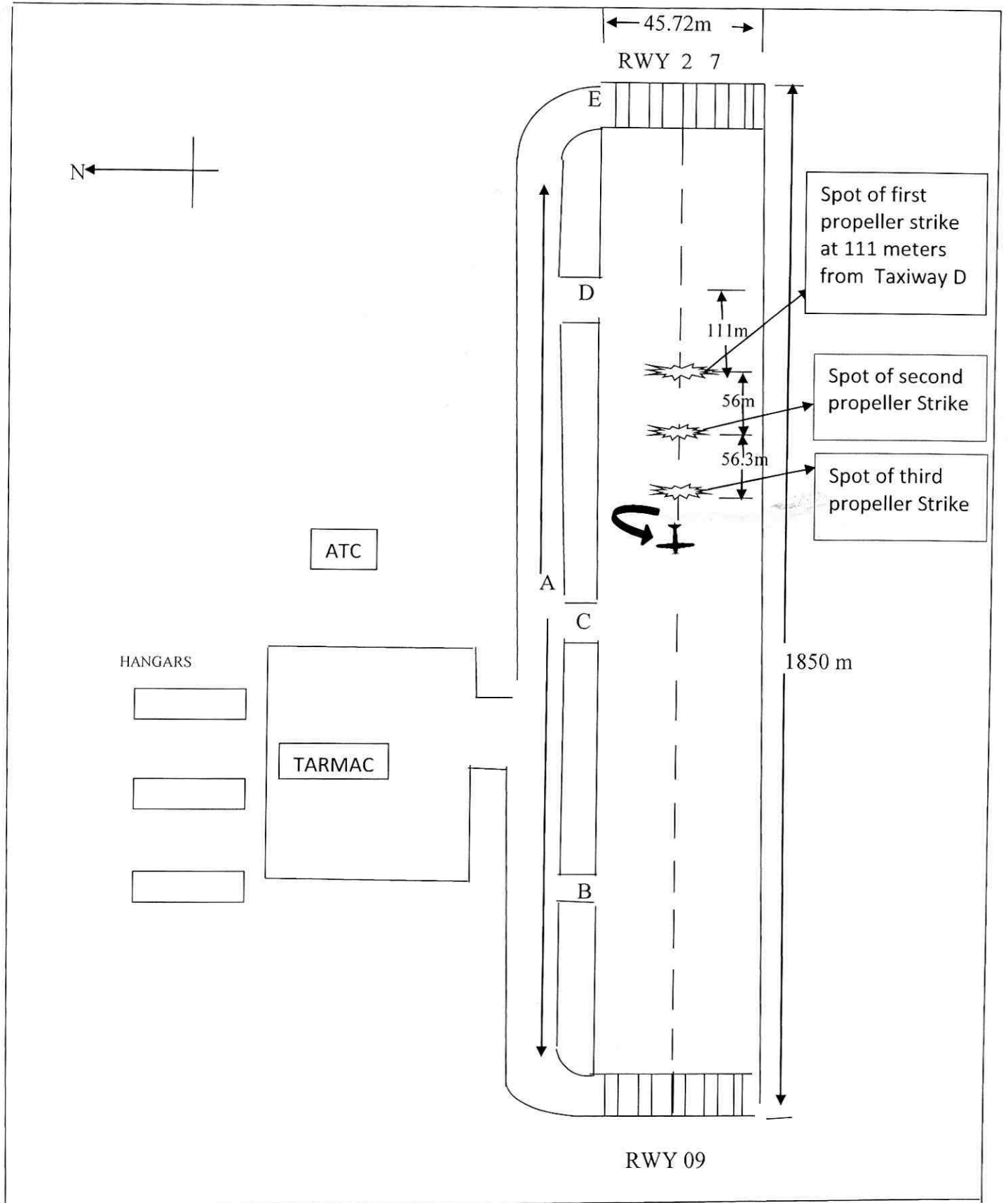
- 1.11.1 Both the propellers blades of the single engine aircraft were bent at 0.3 metres from the tip and damaged beyond economical repair.
- 1.11.2 Nose landing gear shock absorbers called ELASTOMERS consisting of rubber segments and metal plates were found sheared off and damaged and scattered at the bottom of the engine cowling.
- 1.11.3 The broken shock absorber had caused a dent in the metal cladding on the 'fire wall'.
- 1.11.4 The bottom of the engine cowling was damaged by upward movement of nose landing gear strut caused due to impact.
- 1.11.5 Mixture control lever bracket and spring in the 'fuel injector' was damaged due to impact.
- 1.11.6 The starboard wingtip found damaged due to rubbing against runway surface.
- 1.11.7 Mooring ring attached to the wing tip got bent and was pushed inside wing surface under the impact, damaging outermost rib of the wing structure.
- 1.11.8 There was a minor damage to 'Ventral fin' of the aircraft due to impact.

1.11.9 Metal 'Tail Skid' fitted below the ventral fin had deep rubbing marks.

There was no damage to cockpit instruments. Positions of levers and switches in the cockpit are given below:

- Flap Lever : Fully down.
- Trim tab wheel: Nose down side.
- Ignition switch: On.
- Throttle lever : Back.
- Prop Lever : Full fine.
- Mixture Lever : Full rich.
- Battery and alternator switches : On.
- Avionics Master : On.
- All external light switches: On.
- Fuel Booster Pump: On.

Schematic diagram of Fursatganj Airstrip and site of incident.



1.12 Medical & Pathological information:

After the incident she was checked by the doctor of the institute and found unhurt. There was no injury to the flight cadet.

1.13. Fire: There was no fire before or after the incident.

1.14 Survival aspects: The aircraft took-off from Fursatganj airfield for a solo flying training and landed after completion of the flying training at Fursatganj airfield. The flight cadet came out unhurt from the aircraft. Therefore, no search and rescue operation was needed in this case. Seat and seat-belt attachment were secure and did not fail during the incident. No structure of the aircraft had failed before the incident. Although, the nose landing strut was damaged but still the aircraft could be towed to hangar for inspection. The incident was survivable.

1.15 Test and research: Nil

1.16 Organizational & Management information:

1.16.1 Indira Gandhi Rashtriya Uran Akademi , Fursatganj, Amethi, U.P. is a premier national Civil Flying Training Academy. It is an autonomous body under the control of the Ministry of Civil Aviation, Government of India. It functions through its Governing Council headed by the Secretary, Ministry of Civil Aviation, which is the highest decision making body for the organization. IGRUA is headed by a director.

1.16.2. Training Policy for civil flying training is published in Training and Procedure Manual(TPM) of IGRUA in Volume –II, Part-III, Chapter 6. Following aspects of civil flying training are comprehensively covered in this chapter of the Training & Procedure Manual of IGRUA :

- Ground Subjects Training.
- Unsatisfactory Progress—Remedial Training.
- Flying and Simulator Training.
- Slow Progress during Flying Training.
- Discipline & Code of Conduct for flight cadets.

1.16.3. Provisions are made for continuous evaluation of progress of flight cadets. Whenever it is found during assessment that a trainee or flight cadet is not making satisfactory progress in 'Ground subjects', Chief Ground Instructor intervenes to provide counseling and if required, extra training is also provided. For each phase of training, provision for two extra training are made in the Training and Procedure Manual(TPM). If there is requirement for further extra training, a decision in this regard is made by a 'Hearing Board' (HB). Same procedure is adopted for cadets whose progress in flying training is assessed to be slower than normal. In such cases, the Chief Flight Instructor intervenes and counsels the flight cadet concerned. If required, additional flying training (termed as 'Flex sorties') is provided or simulator training is provided depending upon the kind of improvement required for the flight cadet. In flying training also, if more than two additional training is required to be imparted to a slow learner, the same is decided by a 'Hearing Board' (HB).

1.16.4. The Training and Procedure Manual provides for administrative action for any act of indiscipline on the part of the flight cadet. Code of conduct is prescribed and the same is required to be adhered to by 'ladies & gentlemen cadets'. Apart from termination of training on the ground of insufficient progress, a flight cadet or student may also be expelled from training for following reasons:-

- Disciplinary issues,
- Financial issues,
- Medical issues,
- Withdrawal of license required to perform the practical training.

1.17 Additional Information:

1.17.1 The flight cadet flew her first dual training flight on 28.01.2015 on type DA-40 aircraft. She flew her first solo on 06.04.2015 after 21 hours 35 minutes of dual flying. Flight instructors who were imparting her flight training have given their remarks about her performance. Some of their remarks are produced below:-

Sl. No.	Date	Name of Instructor	General Remarks
1.	07.03.2015	Flight Instructor	"Learning slow, forgetful, casual attitude, sometimes absent minded in the cockpit, slow in reaction, poor orientation."
2.	08.03.2015	Flight Instructor	"Checks and procedures forgetful, slow and delayed. Control on aircraft below average. Improvement very less. Inconsistent performance. Not attentive. Situational awareness and orientation-poor."
3.	09.03.2015	Flight Instructor	"Student showing no interest in learning, sometimes argumentative. Casual and careless attitude. Not following or ignoring instructions. Coming unprepared for flying. Sometimes mentally absent during briefing." 10 hours of additional training was recommended.
4.	10.03.2015	Flight Instructor	"No ground preparations. Student's performance below average. Student failed." 10 hours of additional training was recommended and case was referred to CFI for further extension of the hours. She was ordered on 11.03.2015 to fly 05 hours of 'simulator flying' in order to be familiar with circuit procedures for both runways at Fursatganj airfield.
5.	13.03.2015	Chief Flight Instructor	" A marginal sortie. Must work hard on ground."
6.	14.03.2015	Chief Flight Instructor	"Approaches are unsteady, very slow in power correction. Not monitoring speed regularly. Unable to correct for drift /skid."
7.	16.03.2015	Chief Flight Instructor	"Improvement is very slow. Needs to put in lots of hard work on ground towards sortie preparations".

8.	20.03.2015	Chief Flight Instructor	<u>WARNING</u> “You were found to be in possession of your personal mobile phone in the FOC, which is against the laid down policy of IGRUA. You are hereby warned for this act of indiscipline. Any further violation of the laid down rules/instructions in future will result in strict disciplinary action against you.”
9.	25.03.2015	Chief Flight Instructor	Pupil slow in making corrections on approach. Unsettled on short finals. Round offs are in consistent with lots of drift. Considered unfit for solo at this stage.
10.	27.03.2015	Chief Flight Instructor	Marginal improvement. Round offs are inconsistent.
11.	28.03.2015	Chief Flight Instructor	Not monitoring speeds on short finals. Round offs are inconsistent.
12.	31.03.2015	Chief Flight Instructor	<u>WARNING</u> “You were planned for flying on 31.03.2015 but absented yourself from morning briefing. This has been viewed seriously and you are hereby warned for the same. You are required to be present for all the activities planned by the undersigned.”
13.	02.04.2015	Flight Instructor	<u>WARNING</u> “You were given 2 hours Flex on circuit and landing phase due to poor performance. In your solo check sortie flown on 01/4 and repeat solo check flown on 02/4 (due to last landing turn on 01/4), your performance is still found to be not upto the mark and you have not been cleared for first solo. You are hereby warned for your poor performance. You are being given one hour of ‘Flex’ again to improve your approach and landings. There after you are to fly with the undersigned for assessing your performance. You will be flying this ‘Flex’ sortie with another instructor. You were advised to fly one hour on simulator but you have declined to fly in the simulator.”

14.	02.04.2015	Flight Instructor	“Cleared for first solo sortie by Day”.
15.	02.04.2015	Flight Instructor	“ Approach and landing monitored. Satisfactory”
16.	10.4.2015	Flight Instructor	“Performance inconsistent, handling marginal, attitude casual.”
17.	10.04.2015	Flight Instructor	<p style="text-align: center;"><u>WARNING</u></p> <p>“ Student is following wrong procedure while taxiing after completing sortie. It has happened after first and second solo also. After that a detailed briefing has been given to student. Despite of that initiated wrong turn. You are hereby given warning for your casual attitude and carelessness towards the procedures laid down.</p>
18.	29.06.2015	Chief Flight Instructor	<p style="text-align: center;"><u>CHANGE OF INSTRUCTOR</u></p> <p>“On request from the student, flight cadet has been granted a change of instructor. She is to fly with Capt.”</p>

1.18 Useful and effective techniques:

A field camera is installed in the airfield near the runway to record landings of aircraft. This camera tool is very useful in analyzing the deficiencies in approach and landing techniques of the flight cadets. Recording of the field camera was replayed to see the incident flight from approach phase to touch down and events of bouncing, propeller strikes, wing and tail rubbings, veering and halt of the aircraft. The camera showed that the aircraft wings were almost level and approach was stable. During flare, the nose was not pitched up. The aircraft touched on all the three wheels (both main wheels and nose wheel). After touch down, the aircraft bounced seven times. During fourth, fifth and sixth bounce propeller strikes occurred. During fifth bounce, tail strike occurred. During the seventh bounce, wing strike occurred. Propeller stopped rotating after the seventh bounce and aircraft veered towards right edge of the runway. The flight cadet then steered the aircraft towards center line and brought it to a halt.

2 ANALYSIS:

2.1 Serviceability of the aircraft:

The Certificate of Airworthiness of the aircraft was valid up to 30.03.2019. Airworthiness Review Certificate was valid till 09.04.2016 and 'Certificate of Release to Service' (CRS) was valid on 03.07.2015. The aircraft had completed 5056:41 hours since new. Its engine was last overhauled on 05.04.2013. It had completed 3068:10 hours since new (TSN) and 1068:40 hours (TSO) since the last overhaul. Engine propeller had completed 3979:24 hours since new (TSN) and 1590:25 hours since last overhaul (TSO). The aircraft was fully serviceable before the incident flight. No components or part had failed or malfunctioned during the flight. Last maintenance carried out on the aircraft was 50 hours/3 months approved inspection schedule on 30.06.2015 at 5035:05 hours TSN. Next servicing was due at 100 hours/06 months at 5085:05 hours TSN on 30.09.2015. The aircraft was not due for any servicing on the day of the incident. There was no snag pertaining to control surfaces. Load and Trim Sheet was prepared and Centre of Gravity was found to be within limit. After landing, there was 125 litres of fuel and 07 litres oil was left over on board the aircraft which implies that there was no starvation of fuel during the flight. The aircraft was airworthy and serviceable before and during the flight. Thus, Airworthiness and serviceability of the aircraft is not a factor to the incident.

2.2 Weather:

2.2.1 Weather reports are issued by IMD office at IGRUA on hourly basis. The aircraft had taken-off at 1602 IST and landed at 1651 IST. The flight of the aircraft is covered by period of two weather reports issued by India Meteorological Department (IMD), one issued at 1530 IST (1000 Z) and the other issued at 1630 IST (1100Z).

2.2.2. As per weather report issued at 1530 IST (1000 Z), visibility was 5000 metres, haze was present in the weather, wind speed was 03 knots with a heading of 270 °. That is, wind direction was along the runway. There was no cross wind component. The above set of weather conditions suggest that weather was conducive to flying training; and weather was suitable for flight under visual flight rules at the time of take-off of the aircraft.

2.2.3. As per weather report issued at 1630 IST (1100 Z), visibility was 4000 metres, haze was present in the weather, wind speed was 02 knots. Few cloud bases were observed at 2000 feet (600 metres). Visibility was 4000 metres. Wind speed was 02 knots and it was a calm wind

condition. Temperature and dew point remained unchanged. It was largely a stable weather and remained suitable for local flying under visual flight rules. Weather was not a contributory factor to the incident.

2.3. Training aspects of the flight cadet :

2.3.1. The flight cadet was imparted additional training on simulator and counseling at various stages of her training. She was not found fit for first solo at 15 hours 10 minutes of her initial dual flying training. As per 'Training and Procedure Manual' (TPM) of IGRUA she was assigned 02 hours of additional training in the form of 'flex sorties' to improve her flying skills of approach and landing. Based on the performance after the 'flex sorties', pre-solo checks for first solo were carried out on 01.04.2015 and 02.04.2015, and she was again given 01 hour of additional training in the form of 'flex sorties' as per 'Training and Procedure Manual' of IGRUA. On completion of this 'flex sortie' she flew the evaluation sortie with Chief Flight Instructor and was found fit for the first solo and was released for the same. Her progress was monitored closely and she was given extra training, both on aircraft as well as on simulator, wherever needed. She was able to overcome her short-comings with extra training and continued her flying training. It implies that the 'Training and Procedure Manual' of IGRUA has provision for improving the flying skills of flight cadets by way of counseling, assigning additional training in the form of 'flex sorties' or simulator training or both and the same were implemented in this case. The flight cadet, on her request, was allowed a change of instructor also as per the Training and Procedure Manual of IGRUA.

2.3.2. The flight cadet had completed 64 hours of total flying including dual and solo before the incident. She had flown 21 hours 35 minutes of solo and she was able to make stable approaches and safe landings. She was not issued with any warning for these solo landings. She further said that she was taught in all her ground classes that a cadet should never push the 'control stick' forward during touch down, let whatever happen. But she pushed the 'control stick' forward, thereby pitching the nose of the aircraft down which was non-adherence to procedures of safe landing.

2.4. Pilot handling of the aircraft:

2.4.1. She flew her first solo on 06.04.2015 after 21 hours 05 minutes of dual flying training. She had completed 64:00 hours of total flying including 21 hours 35minutes of solo flying on DA-40 aircraft before the incident. She was able to make stable approaches and safe landings in her 'solo circuit and landing' exercises. She had flown 14 hours 20 minutes on the same type of aircraft in last 30 days before the incident. She had flown 02 hours 10 minutes in last one week. Prior to the incident flight on 03.07.2015, she had flown a dual flight of 01:10 hour duration in the morning of 03.07.2015 itself with Chief Flight Instructor. The above flying hours indicate that she was current on flying hours. Her medical certificate was valid beyond the date of the incident.

2.4.2. The take-off and climb of the incident flight was normal. The aircraft flew in the allotted sector without any snag. There was no stall warning during the flight. The flight cadet had made an intentional 'Go-Around' during the first approach. The aircraft performed normal during the first 'Go-Around'. During the second approach to land also, there was no abnormality in the performance. The aircraft touched down on all the three wheels instead of main wheels and bounced. The flight cadet pushed the control stick forward to pitch the nose down. As there was input to pitch the nose down, the nose wheel of the aircraft touched first after the first bounce, followed by main wheels. The nose wheel bounced up again followed by main wheels. Due to continuous input by the flight cadet to pitch the nose down, the nose wheel touched before the main wheels every time during bounces. It was a situation of 'Pilot Induced Oscillation'.

2.5. Analysis of information from Flight Data Recorder and Field Camera:

2.5.1. Information from flight data recorder shows that the flight cadet made a stable approach. The aircraft touched down at 16:51:23 hours approximately. The touch down speed of the aircraft was less than 70 knots. The best speed to glide is between 60 to 68 knots (IAS). The aircraft was almost horizontal. Nose pitch angle was around 1° . Just before touch down its nose dipped. After touch down, the aircraft bounced (vide Altitude versus Time graph of landing roll). Abrupt change in nose pitch values and altitude of aircraft indicate these bounces.

2.5.2. Recording of field camera shows that aircraft wings were almost level. There was a little roll to the left. Approach was fairly stable. The aircraft was almost horizontal to runway. Just before the touch down, the nose pitch dipped and the three wheels touched down on runway together; and then aircraft began to bounce. The altitude of bounces increased with each bounce. The aircraft bounced seven times. The third, fourth, fifth, sixth and seventh bounces were severe. During fourth, fifth and sixth bounce, propeller strikes occurred on the runway. During fifth bounce tail strike occurred. After seventh bounce, right wing strike occurred and propeller stopped rotating. After the seventh bounce the speed of the aircraft became very low and the aircraft veered towards right edge of the runway. The flight cadet steered the aircraft towards center line of the runway and brought it to halt. Then she came out unhurt of the cockpit.

2.6 Circumstances leading to the incident:

Mechanics of 'Pilot Induced Oscillations' was covered in her ground classes. It was taught in all her classes that a cadet should never push the stick forward to pitch down the nose of the aircraft during touch down for landing. The flight cadet made an stable approach but landed the aircraft on all the three wheels instead on main wheels which was not as per the laid down procedure. As the aircraft bounced and nose pitched up; the flight cadet applied correction to pitch down the nose by pushing the control stick forward. This action was a non-adherence to laid down procedure for landing. Due to pitching the nose down, the aircraft landed on nose wheel after the first bounce. The aircraft bounced again. This bounce was higher than the previous one. The flight cadet continued to apply correction and aircraft continued to bounce. The input from the flight cadet and its effect was aiding the bounce and as a consequence of it, the subsequent bounces were progressively higher than previous ones. After every bounce, the aircraft landed on nose wheel. Owing to this, the nose landing gear strut and its shock absorber (elastomers) got damaged. The aircraft had entered in to a state of 'Pilot Induced Oscillation'(PIO) during landing roll. The aircraft bounced seven times. During fourth, fifth and sixth bounce, propeller strikes occurred on the runway and both the propeller blades got damaged.. During fifth bounce tail strike occurred and bottom portion of the tail metal skid was damaged due rubbing. After seventh bounce, right wing strike occurred and propeller stopped rotating. The mooring point below the right wing tip got damaged during the seventh bounce. After the seventh bounce the forward speed of the aircraft became very low and it veered towards right edge of the runway. However, the flight cadet steered it towards center line of the runway and brought to halt. Then she came out of the cockpit. There was no injury to her. The incident of 'pilot induced oscillations'

occurred due to landing the aircraft on all the three wheels instead of main wheels followed by giving the input to aircraft controls for pitching the nose down during bounces. Non-adherence to laid down procedure for landing by the flight cadet caused the incident.

3. CONCLUSION:

3.1 Findings:

- 3.1.1. The Certificate of Airworthiness was valid beyond the date of the incident.
- 3.1.2. The Airworthiness Review Certificate was valid beyond the date of incident.
- 3.1.3. Daily inspection schedule was carried out on the aircraft in the morning of 03.07.2015 by a licensed and approved Aircraft Maintenance Engineer.
- 3.1.4. The aircraft was not due for any scheduled maintenance on the day of the incident.
- 3.1.5. The aircraft was not due for embodiment of any modification.
- 3.1.6. There was no snag in the aircraft before the flight.
- 3.1.7. Certificate of Release to Service was issued and valid on the date of incident.
- 3.1.8. Medical Certificate of the flight cadet was valid beyond the date of the incident.
- 3.1.9. The flight cadet was current on flying training on Diamond DA-40 aircraft.
- 3.1.10. The aircraft took-off and flew in the allotted sector without any system failure or snag. There was no snag in the aircraft during the flight.
- 3.1.11. Centre of gravity of the aircraft was within limit.
- 3.1.12. Fuel and oil used were of correct specifications. There was sufficient fuel and oil in respective tanks on board the aircraft. There was no instance of fuel starvation during the flight.
- 3.1.13. Weather was fine and not a contributory factor to the incident.
- 3.1.14. The 'Training and Procedure Manual' of IGRUA has provision for assigning additional training. She was imparted additional flying training to improve her flying skills.
- 3.1.15. The flight cadet was able to make stable approaches and perform safe landings during solo sorties. She was not issued any warning for her landings during her solo exercises.
- 3.1.16. The flight cadet made a fairly stable approach. Flare was very short.
- 3.1.17. The flight cadet landed the aircraft on all the three wheels together. The aircraft, thereafter, began to bounce forward in its landing roll.
- 3.1.18. The flight cadet pushed the control stick forward for pitching the nose down. Effect of the input from the flight cadet aided the bounce further. The successive bounces were progressively higher. The incident was a case of 'Pilot Induced Oscillation'.

- 3.1.19. The flight cadet was taught very well in her ground classes about mechanics of 'Pilot Induced Oscillations'. However, she did not adhere to the laid down procedure for safe landing.
- 3.1.20. Damages to propellers, wing, tail and nose landing gear strut occurred during the successive bounces after landing.
- 3.1.21. There was no injury to the flight cadet. She came out of the cockpit unhurt.
- 3.1.22. There was no injury to any person outside the aircraft and there was no damage to any equipment outside the aircraft.

3.2. Probable cause of the incident.

The incident occurred during landing due non-adherence of laid down procedures by the flight cadet.

4. SAFETY RECOMMENDATIONS

- 4.1. The involved flight cadet should undergo corrective training for adhering to laid down procedures for safe flying of aircraft.



(HN Mishra)

Dy. Director Air Safety
O/o Director Air Safety (NR)
Enquiry officer: VT-FGA

Date: 17th February 2016

PHOTOGRAPHS OF DIAMOND DA-40 AIRCRAFT,VT-FGA AFTER PROPELLER STRIKE ON 03.07.2015



VT-FGA: Both propeller blades bent in propeller strike.

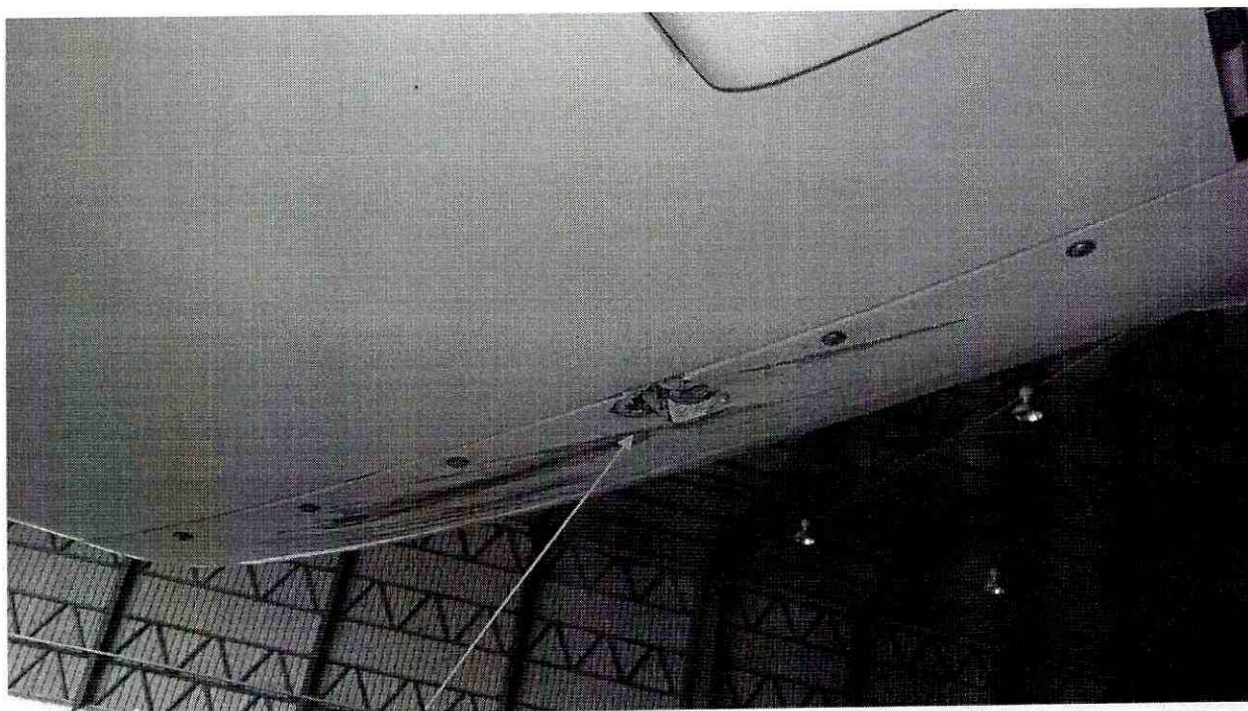


VT-FGA: Nose landing gear strut broken.

PHOTOGRAPHS OF DIAMOND DA-40 AIRCRAFT, VT-FGA AFTER PROPELLER STRIKE ON 03.07.2015



VT-FGA: Rubbing marks on the tail metal skid.



VT-FGA: Mooring ring below right wing tip pushed inside. Skin of lower surface damaged due rubbing.

APPENDIX

Pilot Induced Oscillations:

Pilot-induced oscillations are sustained or uncontrollable oscillations resulting from efforts of the pilot to control the aircraft and occurs when the pilot of an aircraft inadvertently commands an often increasing series of corrections in opposite directions, each an attempt to cover the aircraft's reaction to the previous input with an overcorrection in the opposite direction. An aircraft in such a condition can appear to be switching between upward and downward directions. As such it is a coupling of the frequency of the pilot's inputs and the aircraft's own frequency. It causes an undulating flight path brought about by the pilot's over controlling the aircraft. Every subsequent departure is bigger than the previous one if pilot's correction is out of phase. Pilot-induced oscillation (PIO) occurs when the airplane begins a departure from the desired flight path, and the pilot applies inappropriate, excessive or mis-timed corrections that result in ever-increasing excursions that threaten to force the airplane out of control. In short, the pilot is "behind the airplane" and his/her attempts at regaining control only make matters worse. PIO can occur in any phase of flight, but it is usually associated with pitch excursions on landing. **PIO becomes a real possibility in a bounced landing.** PIO in the pitch axis can occur when pilots make large, rapid control inputs in an attempt to quickly achieve desired pitch attitude changes. The airplane reacts to each large pitch control input, but by the time the pilot recognizes this and removes the input, it is too late to avoid an overshoot of the pilot's pitch target. This, in turn, signals the pilot to reverse and enlarge the control input, and a PIO with increasing divergence may result.

PIO can rapidly develop to catastrophic proportions, even in the hands of an experienced test pilot. Stresses can rapidly damage landing gear and other airplane structures. It can force the airplane off the runway, or out of control in roll or in a stall. Propeller strikes are common in propeller-driven aircraft. Add 'go-arounds' after the main gear touches the ground to your recurrent training regimen. Be well-practiced in establishing the right pitch and angle of attack, while firmly holding the proper attitude to prevent PIO.

Prop strikes can cause immediate, catastrophic engine damage or propeller damage that makes a go-around incredibly risky. They can also cause internal overstresses that will become a catastrophic failure at some point dozens or hundreds of hours in the future, usually without warning.