FINAL INVESTIGATION REPORT ON BELLY LANDING INCIDENT TO M/s. SVKM'S NMIMS TECNAM P2006T AIRCRAFT, VT-MSP ON 06.01.2024 AT SHIRPUR AERODROME

GOVERNMENT OF INDIA
O/o, DIRECTOR AIR SAFETY, WESTERN REGION,
NEW INTEGRATED OPERATIONAL OFFICE COMPLEX,
SAHAR ROAD, VILE PARLE (EAST), MUMBAI-400099

OBJECTIVE

This investigation is conducted in accordance with the provisions of Aircraft (Investigation of Accidents and Incidents) Rules, 2017 of India.

The sole objective of this investigation is the prevention of accidents and incidents and not to apportion blame or liability.

FOREWARD

This document has been prepared based upon the evidence collected during the investigation, opinions 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 accidents or incidents could lead to erroneous interpretations.

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ABBREVIATIONS

A/c	Aircraft
Aircraft	Incident aircraft
AFM	Airplane Flight Manual
AME	Aircraft Maintenance Engineer
AMM	Aircraft Maintenance Manual
ARC	Airworthiness Review Certificate
ATC	Air Traffic Control
CAS	Calibrated Air Speed
CFI	Chief Flying Instructor
CVR	Cockpit Voice Recorder
DATCO	Duty Air Traffic Control Officer
DGCA	Director General of Civil Aviation, India
DME	Distance Measuring Equipment
Dy. CFI	Deputy Chief Flying Instructor
EASA	European Aviation Safety Agency
FAA	Federal Aviation Administration, United States of America
FDR	Flight Data Recorder
FO	Co-Pilot/ First Officer
FRTO	Flight Radio Telephone Operator
GPS	Global Positioning System
IR	Instrument Rating
IST	Indian Standard Time

LH	Left Hand
MAP	Manifold Air Pressure
ME	Multi Engine
Operator	FTO holding approval
PF	Pilot Flying
PFD	Primary Flight Display
PIC	Pilot in Command
PM	Pilot Monitoring
QNH	Pressure setting to indicate elevation
RH	Right Hand
ROD	Rate of Descent
RWY	Runway
TSN	Time Since New
UTC	Coordinated Universal Time
VMC	Visual Meteorological Conditions
VFR	Visual Flight Rules
VOR	Very high frequency Omni Range

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1.	**Aircraft Type**	Tecnam P2006T
2.	**Nationality**	Indian
3.	**Registration**	VT-MSP
4.	**Owner**	SHRI VILE PARLE KELVANI MANDAL, MUMBAI, INDIA
5.	**Operator**	SHRI VILE PARLE KELVANI MANDAL, MUMBAI, INDIA
6.	**Pilot In- Command**	Flight Instructor's Rating holder
7.	**Co-Pilot**	Flight Instructor's Rating holder
8.	**Extent of Injuries**	Nil
9.	**Date and Time of Incident**	06/01/2024, 11:43 UTC approx.
10.	**Place of Incident**	Shirpur Aerodrome, Dhule
11.	**Geographical location of site of Occurrence (Lat. Long.)**	21°19'27.0"N 74°57'21.4"E
12.	**Last point of Departure**	Shirpur Aerodrome, Dhule
13.	**Intended Place of Landing**	Shirpur Aerodrome, Dhule
14.	**No. of Personnel On-Board**	02
15.	**Type of Operation**	Training Flight (Abnormal/Emergency Procedure)
16.	**Phase of Operation**	Landing
17.	**Type of Incident**	Abnormal Runway Contact (ARC)

All timings in this report are in UTC

SYNOPSIS

On 06.01.2024, a multi-engine aircraft Tecnam P2006T (Reg: VT-MSP) belonging to M/s SVKM's NMIMS was utilized for the training of one of the AFI of the institute for his ME rating. One of the Dy.CFI of M/s FSTC, Bhiwani (hereinafter referred to as Instructor) was imparting the training to the AFI of M/s SVKM's NMIMS (hereinafter referred to as trainee) about the abnormal/emergency procedure that was to be carried out which included steep turns, stall recovery and emergency. The aircraft took-off from RWY 09 at time 1038 UTC. After carrying out the abnormal procedures, the aircraft reported to ATC that they are long final RWY 09 at 3000 ft AMSL and an emergency descend was demonstrated by the instructor. At approx. 3 NM from touchdown, TAKE-OFF flap was selected. After obtaining the landing clearance from the ATC, Flaps were set to LAND at around 2-2.5 NM short of touchdown. The landing gear was not extended by the crew and the aircraft made a belly landing at RWY 09 at time 1143 UTC. There was no injury to the crew. The aircraft sustained minor damage.

The incident was investigated by Investigator In-Charge and the Member, appointed by DGCA, India vide letter No. DGCA-15013/1/2024-DAS dated 10/001/2024 in the exercise of power under Rule 13(1) of the aircraft (Investigation of accidents and incidents) Rules 2017.

The cause of the incident is identified as the non-adherence to the SOP by the flight crew resulting in the omission of the landing gear extension procedure culminating in the aircraft landing on its belly.

1. FACTUAL INFORMATION

1.1 History of the Flight

On 06.01.2024, M/s SVKM's NMIMS Tecnam P2006T aircraft bearing registration VT-MSP was cleared by the certifying staff for flights after carrying out the daily inspection, during which no abnormalities were observed. The first flight of the day was an Instrument Flying sortie by the instructor and the trainee.

The trainee, who was an AFI at M/s SVKM's NMIMS, was undergoing training for his multi-engine rating under the instructor. The instructor was the Dy. CFI of M/s FSTC Flying School. The aircraft was then utilized for Instrument Flying (IF) sortie by the instructor and the trainee after being authorized by the CFI.
After take-off at around 07:30 UTC. The trainee performed activities including VOR radial interception, VOR Hold, entries to hold, instrument approach, missed approach and normal landing procedure satisfactorily. The aircraft landed at 0900 UTC. The

sortie was uneventful and no snags/defects were recorded. The trainee had accumulated 06:30 hrs of multi-engine training at this moment.

The aircraft was then flown for a familiarization flight for another trainee pilot and another instructor. The aircraft landed at 1010 UTC without any defects.

As planned, after a break, the instructor and the trainee proceeded to carry out the abnormal/emergency procedure which included steep turns, stall recovery, simulated engine failure and emergency descend. At time 10:38 UTC, the aircraft departed for the sortie and took off from RWY 09 for a climb to 3000 ft on runway heading. Thereafter, ATC gave them different sector to perform the exercises. Initially, the steep turn exercise was demonstrated by the instructor and the same was performed by the trainee. Thereafter, the stall recovery procedure was carried out by the crew. Thereafter, the instructor briefed the trainee about the simulated engine failure.

When the aircraft was approx. 4-5 NM short of touchdown at an altitude of 3000 ft AMSL, the trainee gave a 'long finals RWY 09' call to ATC. The instructor thereafter demonstrated the emergency descend by reducing the Manifold Air Pressure (MAP). The aural alert regarding the incorrect landing configuration was triggered. The speed was approx. 108 kts IAS which more than the V_{LO} (93 kts IAS) and hence, the landing gear was not extended. The instructor stated that he planned to extend the landing gear on finals.

As the aircraft was 3NM short of touchdown, flaps were extended to 'TAKE-OFF' settings. The aircraft was issued the landing clearance by the ATC when it was approx. 2.5 NM on finals. At around this time, the flaps were set for 'LAND' settings. The incorrect landing configuration aural warning was again triggered; however, landing gear was not extended. The AFM Normal procedure checklist was not referred and the actions were done by the crew from the memory.

The aircraft made a belly landing at RWY 09 at time 11:43 UTC, 950 ft from the threshold and halted approx. 554 ft from the touchdown point. There was no fire after the belly landing. The crew themselves opened the door and came out unhurt.

1.2 Injuries to Persons

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

1.3 Damage to Aircraft

Most of the structural damage to the aircraft was sustained by panels of the underbelly and the damages to the equipment/system were restricted to communication and navigation antennas of the DME, Transponder, Marker Beacon and the COM 1 VHF. Further, the LH & RH main wheel hub sustained some damages.

Fig.1: Main Wreckage on the runway

Fig.2: DME antenna

Fig.3: Transponder antenna

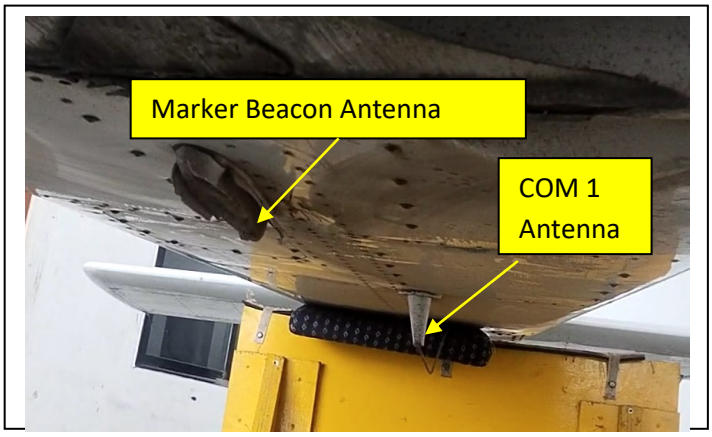

Fig.4: Marker Beacon and COM 1 Antenna

1.4 Other Damage

Nil

1.5 Personnel Information

	Instructor	Trainee
Age	25 years	30 years
License	CPL	CPL
Date of Issue	19/08/2020	14/10/2019
Valid up to	18/08/2025	13/10/2024
Category	Aeroplane	Aeroplane
Date of Class I Medical Exam	05/12/2022	08/08/2023
Class I Medical Valid up to	02/01/2024 (CA-35 form valid for 90 days from 05.12.2023)	20/08/2024
Date of Issue of FRTO Licence	19/08/2020	14/10/2019
FRTO Licence Valid up to	18/08/2025	13/10/2024
IR rating	Valid (Open)	Valid
Instructor rating	FIR	AFIR
Total Flying Experience	1932:25 hrs	443:25 hrs
Total Flying Experience on Type	260 hrs 40 mins	06hrs 30mins
Total Flying Experience on SE aircraft	1656 hrs 45 mins	436hrs 55mm
Total Flying Experience in last 1 year	675 hrs 00 mins	219:25hrs
Total Flying Experience in last 6 months	353 hrs 55 mins	118hrs 40mins
Total Flying Experience in last 30 days	72 hrs 30 mins	23hrs 20mins
Total Flying Experience in last 7 days	10 hrs 35 mins	09hrs 30mins
Total Flying Experience in last 24 hours	4 hrs 02 mins	04hrs 02mins
Duty Time last 24 hours	8 hrs	9hrs
Rest before the day of incident	16 hrs	16 hrs
Ratings	C152, C172, PA-34, Tecnam P2006T	C172

Prior to operating their first sortie of the day, both instructor and the trainee had undergone BA test and the results were negative.

The FTPR of the trainee for the sorties carried out for the purpose of multi-engine rating prior to the incident sortie indicates that the trainee performed the exercises satisfactorily.

1.6 Aircraft Information

1.6.1 General

The Tecnam P2006T aircraft is a twin-engine, high-wing having a semi-monocoque fuselage structure with fully retractable landing gear, commonly used as a general aviation aircraft for touring and training purposes. The aircraft is equipped with two Rotax 912 S3 engines and MTV -21-A-C-F propeller for each engine.

The Aircraft VT-MSP (MSN: 278) was manufactured in the year 2019 and was registered with DGCA in the name of M/s Shri Vile Parle Kelvani Mandal (SVKM) in the same year under Category '. The Certificate of Airworthiness Number 7220 under 'Normal' category with subdivision "Passenger" was issued by DGCA on 24.09.2019.

The specified minimum operating crew is "one" and the maximum all up weight is 1230 Kgs. The ARC was valid as of date of incident.

The aircraft and its engines were being maintained as per the maintenance program, approved by DGCA, consisting of Calendar Period/ Flying Hours based maintenance.

Before the incident sortie, the aircraft, both the engines and both the propellers had logged a total of 1490:40 hrs TSN. The last major inspection was 100 hrs inspection carried out on 14.12.2023.

On 06.01.2024, before the operation, the daily inspection of the aircraft was carried out by the certifying staff and no abnormalities were observed. The defect records do not specify any abnormalities w.r.t. the landing gear. Further, as per the statement of the crew, there were no deviations/exceedances of any of the parameters.

As per the approved weight schedule, the empty weight of the aircraft is 875.3 Kg. The maximum usable fuel quantity is 140 Kg. The aircraft has a maximum landing weight (MLW) of 1230 kgs. Empty weight CG is 0.38 meters aft of datum.

The load sheet of the incident sortie was calculated correctly and the C.G was within limits. All the concerned Airworthiness Directive, mandatory Service Bulletins, DGCA Mandatory Modifications on this aircraft and its engine were complied with as on date of incident.

Airframe	
Manufacturer	Costruzioni Aeronautiche
Type	Tecnam P2006T
Owner	M/S SHRI VILE PARLE KELVANI MANDAL
Operator	M/S SIIRI VILE PARLE KELVANI MANDAL
MSN	278
Year of Manufacture	2019
Certificate of Registration	5117 dated 17/06/2019
Certificate of Airworthiness issue date	24/09/2020
Airworthiness Review Certificate	Valid
Category	NORMAL
Minimum Crew Required	ONE
Maximum All Up weight	1230Kg
Last major inspection	100 Hrs schedule on 14/12/2023
Last inspection	ELT annual inspection on 06/01/2024
Next scheduled inspection	50 Hrs inspection
Next major inspection	100 Hrs schedule inspection
Airframe TSN	1490:40 Hrs
Engine	
Manufacturer	BRP -Rotax GMBH & Co KG
Type	Rotax 912 S3
Engine Serial no.	ENG# 1:9139064, ENG#2:9139067
Time Since new(TSN)	ENG# 1: 1490:40 Hrs, ENG#2: 1490:40 Hrs
Last inspection carried out	100 Hrs schedule on 14/12/2023
Last major inspection carried out	100 Hrs schedule on 14/12/2023
Propeller	
Manufacturer	MT Propeller
Type	MTV-21-A-C-F
Part No.	#1:MTV-21-A-C-F/CF 178-05 #2: MTV-21-A-C-F/CF178-05
Serial No.	#1:181338, #2:181343
TSN	#1: 1490:40 Hrs #2: 1490:40 Hrs

1.6.2. Landing Gear (Indicating/Alerting) System

The landing gear retraction system is of electro-hydraulic type, powered by a reversible pump which is electrically controlled by the LG control knob located on the LH instrument panel and by the legs position micro switches: these ones allow for detecting landing gear “down-locked” and “up” positions and for alerting the pilot by

aural means should the approach and landing configuration be incorrect, in terms of flaps/throttle levers/landing gear position, in order to avoid an unintentional gear-up landing.

The LG indication system is electrical and it is composed of the following:
The three green indications is shown on the PFD only when the respective gear is “down-locked”, three amber cross is shown when the gear is in transit “up” or “down”. When the gear is uplocked, ‘UP’ will be shown on the PFD. for the respective landing gear. (Fig. 5)

A warning horn alerts the pilot when the landing gear control knob is in UP position and at least one of the two throttle levers and/or flaps are respectively set to idle and to LAND position. Further, a red light is illuminated at the landing gear control knob for the aforesaid condition. (Fig. 6)

Fig. 5: Landing gear uplock showing on the PFD

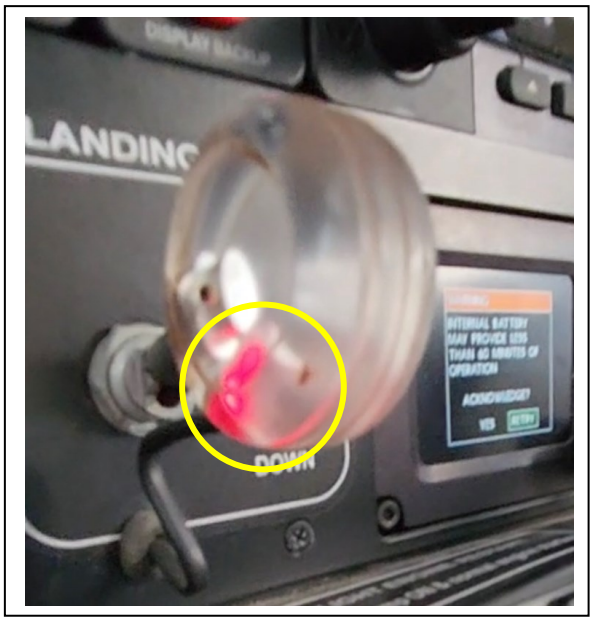

Fig. 6: Red light being illuminated on the landing gear control knob indicating and incorrect landing configuration

The aircraft was jacked up on the runway, landing gears were extended and the aircraft was towed to the hanger manually. After the aircraft was brought to the hanger, it was jacked again to carry out the landing gear extension/retraction test. The landing gears were extending and retracting normally. All three green lights indicated 'ON' on the PFD after the landing gear was extended and downlocked.

When the landing gear was in the retracted position and when the throttle lever was brought to idle position, the aural warning triggered and the red light on the landing gear knob were observed. Further, the stall warning horn was also simulated, triggering an aural warning.

1.6.3. AFM Normal Procedure Checklist

As per the AFM normal procedure (before landing) checklist mandates the extension of the landing gear when the speed is below 93 kts IAS. The extract of the checklist is reproduced below.

REAR PASSENGERS SEATS	FULL AFT/LOWER POSITION
LH & RH ELECTRICAL FUEL PUMP	BOTH ON
ON DOWNWIND LEG: FLAPS T/O	VFE = 122KIAS
SPEED BELOW 93 KIAS LANDING GEAR CONTROL KNOB	**DOWN -** **CHECK GREEN LIGHTS ON**
CARBURETTORS HEAT	CHECK OFF
LH & RH PROPELLER LEVER	FULL FORWARD
ON FINAL LEG. SPEED BELOW 93 KIAS	FLAPS FULL
FINAL APPROACH SPEED	VAPP-71KIAS
LANDING & TAXI LIGHT	ON
TOUCHDOWN SPEED	65 KIAS
BEFORE LANDING CHECK LIST	COMPLETED

The crew, in their statement, has stated that they have not referred the checklist, which was onboard, during the landing.

1.7 Meteorological Information

The visibility is quantified by the DATCO by sighting of various obstacles (such as cell phone towers, etc). An altimeter instrument is stationed at ATC for obtaining the QNH while the winds are noted from the wind socks and the temperature and dew point are obtained from the third party application.

The DATCO had noted the following meteorological conditions for Shirpur aerodrome. VMC conditions prevailed at the aerodrome and is not a factor to the incident.

Time	Wind Direction and Speed	Visibility	Trend	Temp and Dew Point	Cloud	QNH (hPa)
1030	000 deg at 05KT	5000	NOSIG	27/20	NSC	1015
1100	000 deg at 05KT	5000	NOSIG	26/20	NSC	1015

1.8 Aids to Navigation

There are no nav-aids available at Shirpur Aerodrome. The DME distance is indicated to the crew on Gramin Display based on the GPS data.

1.9 Communication

Two-way communication was always available between the aircraft and the ATC on frequency 122.75 Mhz.

1.10 Aerodrome Information

Shirpur Aerodrome is a privately owned aerodrome (owned by M/s Priyadarshini SahakariSoot Girni Ltd) and it has been leased to SVKM's NMIMS University "Academy of Aviation".The airstrip at the aerodrome is being used exclusively for training flights by Academy. Shirpur aerodrome is located at Tande village, Dhule district, Maharashtra, India. Shirpur aerodrome is neither being used as a regular place for landing and departure by a scheduled air transport service nor for a series of landing and departures by any aircraft carrying passengers or cargo for hire or reward.

The aerodrome is situated at an elevation of 180.57m (592.26ft). The airport has a single RWY (09/27) with a length of 1334 metres (4376.64ft) and width of 23 metres (75ft).

Shirpur aerodrome is not a critical airfield and is used for flying training by NMIMS Academy of Aviation. The ATC is controlled and functioned by the Academy of Aviation itself. There are no facilities available for ATC tape recording/SMGCS recording at the airport.

The RWY 09 is having a displaced threshold located 57m from the RWY end. The declared distances for RWY are as under:

RWY Designation	**Elevation**	**TORA(M)**	**TODA(M)**	**ASDA(M)**	**LDA (M)**
09	600ft AMSL	1334	1334	1334	1277
27	648ft AMSL	1334	1334	1334	1334

1.11 Flight Recorders

The aircraft was not equipped with DFDR or CVR recorder, which is also not mandatory as per CAR Section 2 Series I Part V. However, the navigational data from Garmin SD card is available.

As per the data, at time 17:11:18 IST, the aircraft started its descend from approx. 3000 ft AMSL when it was 4.4 NM short of touchdown. The MAP was reduced from 22.4 psi to ~17.47 psi when the aircraft was maintaining a speed of ~108 kts IAS. At around 17:13:06 IST, the MAP was reduced to 12 psi when the altitude was 2110 ft AMSL. The rate of descend was almost within 1000 ft/min while the aircraft was approaching, till 17:13:13 IST. When it started to descend at a higher RoD when it was 1.3 NM short of a touchdown. Flare was carried out by the crew correctly and aircraft made contact with the runway at around 17:14:25 IST at speed of approx. 56 kts IAS. After contact, the parameters regarding the aircraft attitude, vertical acceleration stopped recording.

1.12 Wreckage and impact information

The aircraft landed on its belly on RWY 09, 950 ft from the threshold, and rested at 554 ft from the point of first contact, on a heading of 082 deg magnetic. There was no wreckage. The track of the aircraft after it had touchdown on the runway has been depicted below.

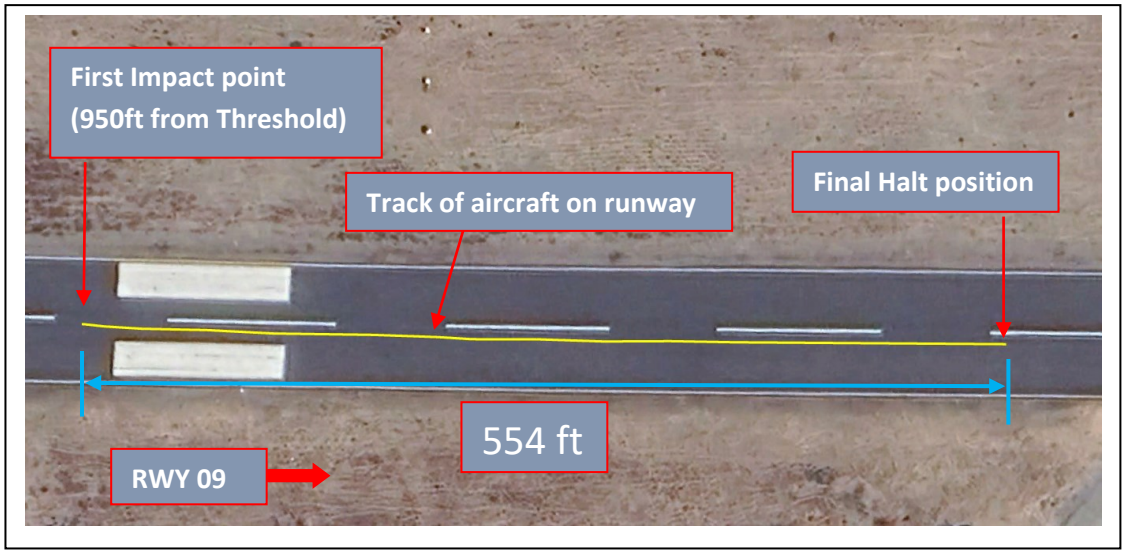

Fig.7: Track of aircraft during the belly landing

1.13 Medical and pathological information

Post-incident, both pilots were subjected to BA examination and psycho-substances test and the results were negative.

1.14 Fire There was no fire before or after the incident.

1.15 Survival Aspects No human injuries were reported in the incident. The incident was survivable.

1.16 Tests and research

1.16.1. Analysis of the engine oil and fuel

The engine oil was drained from each engine for laboratory analysis and the same was sent to DGCA AED lab. The sample of both engine oil was subjected to testing as per the relevant American Society for Testing and Materials (ASTM) method and the results were satisfactory. A sample of fuel (AVGAS 100LL) was also sent and was subjected to lab analysis as per the specifications. The test results were satisfactory.

1.17 Organizational and Management Information

Academy of Aviation (AOA) under SVKM NMIMS group is approved flying training institute established in the year 2009 and approved vide DGCA Letter No.V.22011/24/2007-FG dated 13.04.2016. It is situated at Shirpur in district Dhule of Maharashtra. NMIMS's Academy of Aviation is structured under the management of the Accountable Manager and was approved by DGCA to impart flying training to student pilots and the approval was valid on the date of incident.

NMIMS AOA has been established primarily to provide integrated flying and ground training to students towards obtaining/renewing the following SPL, FRTO, PPL, CPL, IR, AFI/FI rating and extension of aircraft rating & conversion.

The Engineering setup at the academy 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. The academy uses DGCA approved Training and Procedure Manual for carrying out flying training.

1.18 Additional Information

Excerpts from the interview

Instructor: The instructor stated that after carrying out the steep turns, stall recovery procedure, and briefing engine failure securing procedures, they went ahead for emergency descend when they were at long finals. MAP was reduced for the same and an aural warning regarding incorrect landing configuration was heard, however, the landing gear was not extended as the speed was greater than V_{LO}.

The trainee was the PF and Instructor was partially having control. As he was demonstrating the manoeuvre, he planned the landing gear extension on finals.
At around 3NM short of touchdown, flaps were taken to TO settings and then to LAND setting when they were 2-2.5 short of touchdown.
He forgot to extend the landing gear and was aiming for touchdown. All parameters were normal. He stated that he had forgotten to refer to the normal procedure checklist. Further, the 3 greens call-out was also not made/reported to the ATC.

He took over the control and held the control column back once he heard the unusual sound when the aircraft made contact with the ground.

Trainee: The trainee stated that he reported long finals to the ATC and the instructor was demonstrating the emergency descend. Up to the point of roundout, everything was normal and at the time of touchdown, he heard the scratching sound of undercarriage.

DATCO: He stated that he sighted the aircraft when it was on short finals with the aircraft approaching without the landing gear. Landing clearance was also issued despite not receiving a '3 greens' call from the aircraft assuming that the aircraft would carryout a missed approach procedure as the crew were performing abnormal/emergency exercise. But for this sortie, 3 greens call-out was not given to ATC.

During the post-incident interview, both the pilots stated that they referred normal procedure checklist and '3 greens' call was given to the ATC for all their previous sorties. The reporting of '3 greens' for the previous sorties were also confirmed by the DATCO.

1.19 Useful or Effective Investigation Techniques

Nil

2. ANALYSIS

2.1. Serviceability of the Aircraft

The aircraft had a valid Certificate of Airworthiness and the ARC had been valid as of the date of the incident. As per the records, the aircraft had been maintained in accordance with the Approved Maintenance Program. The aircraft had accumulated a total of 1490:40 FH prior to the incident flight.

All the concerned AD, mandatory SBs, and DGCA mandatory modifications on this aircraft and its engine were complied with as on date of the incident. The last major inspection was 100 hrs/yearly completed on 14.12.2023. No abnormalities were observed regarding the landing gear during this inspection. The CRS was issued after the inspection.

Last maintenance done on this aircraft was the ELT annual inspection when the aircraft had accumulated 1488:25 FH and the CRS was issued on 06.01.2024, prior to the first flight of the day. There were no defects/snag regarding the landing gear system.
Prior to the operation of the first sortie of the day, the AME had carried out the daily inspection, and no abnormalities were observed. Further, no defect entry was made on the sortie of the day, prior to the incident sortie.

Further, the crew had also stated that there were no deviations/exceedances of any of the parameters and/or any defect w.r.t. landing gear system. Therefore, the aircraft was airworthy as on date of the incident. Also, no abnormalities were found during the laboratory analysis of the fuel and engine oil sample w.r.t. their specifications.

After the incident, the aircraft was jacked up on the runway and the landing gears were extended. After that, aircraft was brought to the hanger. It was jacked up again to carry out the landing gear extension/retraction check. The landing gears were extending and retracting normally. All three green lights indicated 'ON' on the PFD after landing gear extension and went off when retracted up.

Further, during the landing gear retraction check, the aural warning (horn) and the red light were observed when the throttle lever was in idle position for simulating an incorrect landing configuration. From the above, it is confirmed that the landing gear systems and related landing configuration warning system were working normally during the flight and hence, is not a factor to the incident.

2.2. Flight Operations

2.2.1. Ongoing training and preparation for the sortie

Both the trainee and the instructor were valid on their appropriate license, ratings, and medical as on date of the incident. They were fit to undertake the sortie. The trainee had already undergone 06:30 hrs of training with the instructor before operating the sortie wherein a total of 20 landings were carried out, out of which 06 were night landings. Both pilots stated that the CRM between them were good. During his ME rating training, the trainee carried out all the exercises satisfactorily.

The sortie had been authorized by the CFI. Pre-flight inspections were done by the trainee and no abnormalities were found. The load and trim was correctly calculated. The instructor briefed the trainee about the abnormal/emergency exercise to be carried out, which included steep turns, stall recovery and emergency descend. The trainee was aware of the nature of the sortie.

2.2.2. Non reference to the checklist and lack of situational awareness leading to the incident

When the aircraft was approx. 4-5 NM short of touchdown at an altitude of 3000 ft AMSL, the instructor demonstrated the emergency descend by reducing the MAP which had triggered the aural alert (horn) regarding the incorrect landing configuration. This was taken cognizance of by the instructor.

At this time, as the speed (approx. 108 kts) was more than the $V_{LO,}$ the landing gear was not extended. Therefore, the instructor planned to extend the landing gear on finals when the speeds would reduce after the deployment of flaps.

The flaps were extended to 'TAKE-OFF' settings when the aircraft was 3NM short of touchdown and after receiving the landing clearance by the ATC, the flaps were set for 'LAND' settings when the aircraft was approx. 2.5 NM short of touchdown. The crew was carrying out the actions from memory. The before-landing normal procedure checklist was not referred.

Although, the incorrect landing configuration aural warning again triggered none of the crew had noticed the same. The crew had also not taken cognizance of the landing gear uplock/downlock status on the PFD, and the red light illuminated on the landing lever control knob. The crew also missed to check the status of landing gear to give a '3 greens' call to the ATC. Due to the non-reference to the normal procedure checklist and the failure to take cognizance of the aural alert and visual cues, the crew forgot to extend the landing gear resulting in belly landing at a speed of approx. 56 kts and had halted approx. 554 ft from the touchdown point.

It was when the underbelly of the aircraft made contact with the ground, the crew became aware about the lapse on their part. Although the instructor stated that he took over and held the control column back for a positive pitch, however the same could not be corroborated from the recorded parameters as the parameters pertaining to the aircraft attitude stopped recording after the aircraft made contact with the ground.

3. CONCLUSION

3.1. Findings

3.1.1. The Airworthiness Review Certificate of the aircraft was valid and the aircraft was maintained in accordance with the approved maintenance program. Daily inspection was carried out by the certifying staff and no abnormalities were observed. No defects were reported on the aircraft before the incident sortie. The aircraft was airworthy.

3.1.2. Both instructor and trainee have valid licenses and ratings. Both the pilots had undergone BA tests prior to the first sortie of the day and the test results were negative.

3.1.3. The trainee had already undergone 06:30 hrs of training with the instructor before operating the incident sortie wherein a total of 20 landings were carried out.

3.1.4. The trainee was briefed adequately about the emergency exercises by the instructor prior to the sortie.

3.1.5. The instructor demonstrated the emergency descend by reducing MAP thereby triggering the aural alert (horn) regarding the incorrect landing configuration. This was taken cognizance of by the instructor. As the aircraft speed was greater than V_{LO}, the instructor planned to extend the landing gear on finals.

3.1.6. Incorrect landing configuration aural alert (horn) triggered again when the flaps were set for 'LAND' settings when the aircraft was approx. 2.5 NM short of touchdown. However, none of the crew had noticed the same.

3.1.7. The crew had also not taken cognizance of the landing gear uplock/downlock status on the PFD, and the red light illuminated on the landing lever control knob. Further, the crew had not discussed about the usual '3 greens' call to the ATC.

3.1.8. The crew was carrying out the actions from memory. The before landing normal procedure checklist, was not referred.

3.1.9. The aircraft made a belly landing, due to non-adherence to the SOP, at a speed of approx. 56 kts and had halted approx. 554 ft from the touchdown point.

3.2. Probable Cause

Non-adherence to the SOP by the flight crew resulted in the omission of the landing gear extension procedure culminating in the aircraft landing on its belly.

4. SAFETY RECOMMENDATIONS

In light of the findings, necessary corrective training to the involved crew as deemed fit by DGCA HQrs.

(Vaishnav Vijayakumar)
Air Safety Officer
Member

(Vipin Venu Varakoth)
Deputy Director Air Safety
Investigator In-charge/VT-MSP

Date: 22.03.2024
Place: Mumbai