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(i)

FINAL REPORT

INVESTIGATION INTO ACCIDENT OF CESSNA-152 AIRCRAFT REG NO S2-AFK OF GALAXY FLYING ACADEMY LTD OCCURRED ON 09 JANUARY 2021 AT VGRJ AIRPORT, RAJSHAHI, BANGLADESH

PUBLISHED BY
OFFICE OF THE AIRCRAFT ACCIDENT INVESTIGATION COMMITTEE OF BANGLADESH

FOREWORD

This investigation of accident has been conducted by the Aircraft Accident Investigation Committee of Bangladesh (AAIC-BD), in accordance with Bangladesh Civil Aviation Act 2017 and in conformity with Annex 13 to the Chicago Convention on International Civil Aviation.

The Head of the Committee received a Mandatory Occurrence Report (MOR) through an e-mail sent by the Operator, narrating about the Accident of one Cessna-152 Trainer Aircraft, Nationality and Registration Mark S2-AFK that met with an accident while landing at Runway 35 of VGRJ (Shah Makhdum Airport Rajshahi, Bangladesh) on 09 January 2021.

Following the occurrence, the Head of the Committee instantly formed a 'Go-Team' comprising two investigators, one from operations and the other from engineering of the Committee and advised them to proceed by the first available means to Rajshahi to inspect and protect the necessary evidences. The Head of the Committee also advised the Airport/Aerodrome authority of VGRJ on telephone for ensuring adequate protection of all the evidences and safe custody of the aircraft and its contents until the arrival of the 'Go-Team' at the site of accident.

The 'Go-Team' left Dhaka for Rajshahi by the first flight on 10 January 2021 as there was no flight on the day of occurrence. This movement by the 'Go-Team' was initiated in pursuance to Standard 3.3 of ICAO Annex 13 to take all reasonable measures to protect the evidence and maintain safe custody of the aircraft and its contents for such a period as may be necessary for the purposes of investigation.

On the day of accident, the Head of Committee sent a 'Notification' of the accident to all concerned Authorities, Agencies and Organizations (National and International) as per the requirements of Standard 4.1 of Annex 13.

On 10 January 2021, the Head of Committee formed 'two-member' Aircraft Accident Investigation Team (AAIT) by issuing a 'Memorandum' to conduct the investigation. The AAIT comprised the Head himself as Investigator-in-Charge (IIC) and the Member (Engineering) of AAIC-BD as the Member of the Investigation. The IIC went to Rajshahi on the same day by the next available flight to start the investigation.

To comply with the requirements of Standard 7.4 of Annex 13, the AAIC-BD dispatched and published a 'Preliminary Report' of the investigation of the accident within 30 days following the date of occurrence.

During the process of investigation, the AAIT made some inconclusive opinion regarding the breakage of the aircraft's right landing gear wheel assembly, PT No. 0441212-6, which contributed largely for the aircraft to sustain heavy damage. Question arose to AAIT as to whether the occurrence was due to misaligned heavy landing of the aircraft by the flight crew or material failure? To find out the answer, the AAIT sought NTSB's expert opinion for confirmation through 'Lab-test' of the broken parts. The process for communication, sending the aircraft parts to NTSB, conducting the test and receiving the report etc. took time, especially due to the on-going Covid-19 pandemic.

Following the receipt of the 'Lab-test' from NTSB, the AAIT compiled the 'Draft Final Report' projecting an updated status of the 'Preliminary Report' and the Head of the Committee circulated the same only to concerned Authorities, Agencies and Organizations for their significant and substantiated comments. This was to comply with the requirements of Standard 6.3 of Annex 13.

According to Standard 6.5, the investigation authority is required to publish the final report of investigation within 12 months from the date of occurrence, else, it shall make an 'Interim Statement' publicly available on each anniversary of the occurrence, detailing the progress of the investigation and any safety issues raised (Standard 6.6).

As the AAIT anticipated that the receipt of the Lab-test report could surpass 12 months from the date of accident, the Head of the Committee, in compliance with Standard 6.6 of ICAO Annex 13, published an 'Interim Statement' just prior to the first anniversary of the accident.

The Committee received a few comments from a number of recipients on the 'Draft Final Report' and incorporated them by amending this Final Report as per Standard 6.3 of ICAO Annex 13. The comments have been systemically documented in the investigation folder as per Section 4.1 of this report.

This Final Report has been derived from the factual information and evidences so far gathered during the ongoing investigation of the accident. The Report is being distributed to all concerned and public for the purpose of prevention of accidents and incidents in compliance with the requirements of Standard 6.4 and 6.5 of Annex 13.

The AAIC-BD conceives that any Aircraft Accident Investigation and Analysis thereof, should focus on identifying the true underlying causes and/or contributing factors rather than specifically indicating some human responsibility for the occurrence.

According to ICAO and that of the AAIC-BD, the sole objective of this investigation is to prevent aircraft accidents and incidents and it is not the purpose of this investigation activity to apportion blame or liability.

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List of Acronyms

AAIC	Aircraft Accident Investigation Committee
AAIC-BD	Aircraft Accident Investigation Committee of Bangladesh
AAIT	Aircraft Accident Investigation Team of AAIC-BD
ACCREP	Accredited Representative
AME	Aircraft Maintenance Engineer
ATC	Air traffic Control
ATO	Approved Training Organization
ATPL	Airline Transport Pilots License
CAA	Civil Aviation Authority
CAAB	Civil Aviation Authority of Bangladesh
CPL	Commercial Pilot License
CFI	Chief Flying Instructor
Committee	Aircraft Accident Investigation Committee
DME	Distance Measuring Equipment
ERP	Emergency Response Plan
FIR	Flight Instructor Rating
FSO	Flight Safety Officer
FSR	Flight Standard and Regulations
GF	General Flying
ICAO	International Civil Aviation organization
IF	Instrument Flying
IFR	Instrument Flight Rules
IIC	Investigator-in-Charge
IP	Instructor Pilot
IR	Instrument Rating
IT	Instructional Technique
LT	Local Time
Ltd	Limited
MB	Millibar
N/A	Not Applicable
NDB	Non-Directional Beacon
NDT	Non-Destructive Test
NTSB	National Transportation Safety Board, USA.
OPS	Operations
PPL	Private Pilot License
REG	Registration
RWY	Runway
SOP	Standard Operating Procedure
SP	Student Pilot
SPL	Student Pilot License
TPM	Training and Procedures Manual
UTC	Coordinated Universal Time
VFR	Visual Flight Rules
VGRJ	Shah Makhdum Airport, Rajshahi, Bangladesh.
VOR	VHF Omnidirectional Radio Range

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FINAL REPORT

INVESTIGATION INTO ACCIDENT OF CESSNA-152 AIRCRAFT REG NO S2-AFK OF GALAXY FLYING ACADEMY LTD OCCURRED ON 09 JANUARY 2021 AT VGRJ AIRPORT, RAJSHAHI, BANGLADESH

1. TITLE

1.1 Composition of Title

1.1.1 Name of the Operator	Galaxy Aviation Ltd
1.1.2 Name of Manufacturer	Cessna
1.1.3 Aircraft Model	Cessna-152
1.1.4 Aircraft Nationality	Bangladesh
1.1.5 Aircraft Registration Marks	S2-AFK
1.1.6 Place of the Occurrence	VGRJ (Shah Makhdum Airport Rajshahi, Bangladesh)
1.1.7 Date of the Occurrence	09 January 2021

2. SYNOPSIS

2.1 Details of Synopsis

2.1.1 Notification of accident to national and foreign authorities?	The Office of the Aircraft Accident Investigation Committee of Bangladesh notified to all relevant Authorities, Agencies and Organizations as per Standard 4.1 of ICAO Annex 13. The addressees were: 1. Ministry of Civil Aviation and Tourism, Government of Bangladesh; 2. Civil Aviation Authority of Bangladesh; 3. Galaxy Flying Academy Ltd, Bangladesh; and, 4. National Transportation Safety Board (NTSB), USA.
2.1.2 Accident Investigation Authority?	Aircraft Accident Investigation Committee of Bangladesh (AAIC-BD).
2.1.3 Accredited Representation?	(a) Having received the Notification from the AAIC-BD, the NTSB responded immediately and confirmed that they would remain standby for any kind of support, should the AAIC-BD require; (b) After visiting the place of incident and having seen the wreckage, the Aircraft Accident Investigation Team (AAIT) of AAIC-BD assumed that the failure of right landing gear wheel spring assembly Part No 0441212-6 could be either as a result of heavy misaligned landing with the RWY centre line of the aircraft or material failure. (c) Accordingly, the AAIT requested the NTSB to assign an 'Accredited Representative' (ACCREP) from USA to provide assistance on this issue. The NTSB, nominated an Accredited Representative who was included in the investigation. (d) To find out the cause of failure of the right landing gear wheel spring assembly, the AAIT, intended to obtain expert's opinion from NTSB, for confirmation through 'Lab-test', for material failure or not. (e) Accordingly, the AAIT coordinated the ACCREP of USA and sent the Spring Assembly Landing Gear RH, Pt No. 0441212-6 & AXLE- Main landing gear attaching parts, Pt No 0441203-1 for 'Material Test' in the laboratory of National Transportation Safety Board (NTSB), 490L 'Enfant Plaza, SW Washington, DC 20594, USA on 23 January 2022.

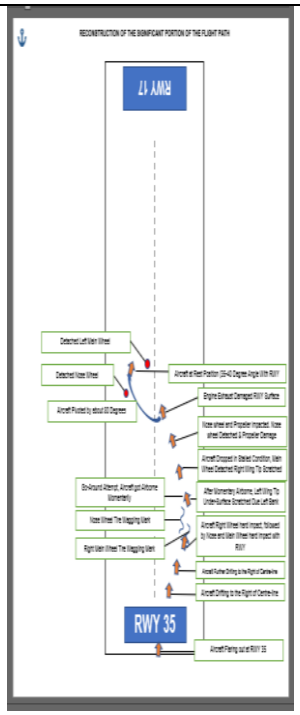
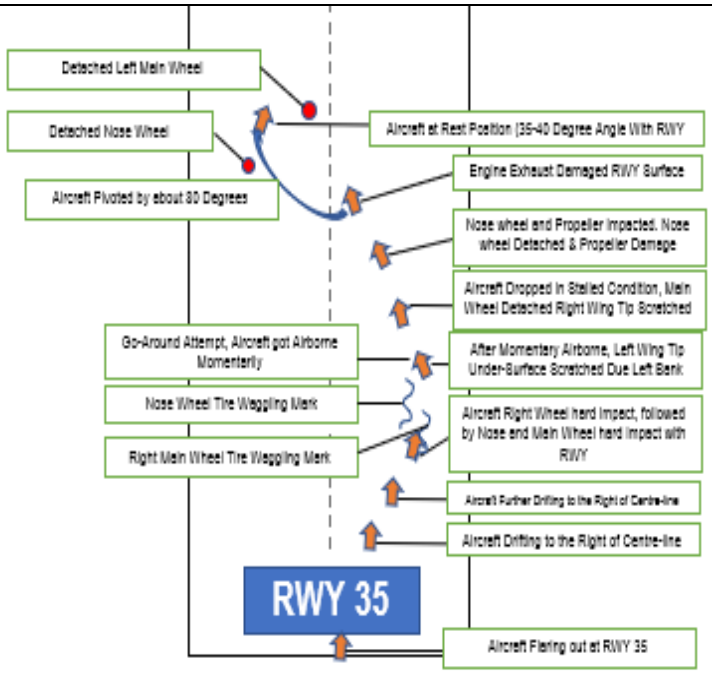
	(f) The AAIT received the result of the Material Test Report from the Accredited Representative of NTSB on 31 March 2022. The lab-test report has been outlined in 3.1.16.1 (d).
2.1.4 Organization of the Investigation?	Aircraft Accident Investigation Committee of Bangladesh (AAIC-BD)
2.1.5 Authority releasing the report?	Aircraft Accident Investigation Committee of Bangladesh (AAIC-BD)
2.1.6 Date of distribution of the report?	24 July 2022.
2.1.7 Brief resume of the circumstances leading to the accident?	(a) While in the downwind of the designated 'Left-hand' circuit at 1000 feet of RWY 35 of VGRJ, the Instructor Pilot asked the Student Pilot to make a 'Zero-Flap' 'Touch and Go' landing. (b) The SP flew the aircraft through the left-base and on-final uneventfully. During flare-out the aircraft started to drift to the right side while the IP instructed the SP to take corrective action by going back towards the centerline of the runway. (c) Meanwhile, the right main wheel impacted heavily on the right half of the runway misaligned with the centre line. (d) The IP took over the control of the aircraft and attempted a 'Go-around' wherein, the aircraft got lifted momentarily by about 2-5 feet but fell on the runway in stalled condition, resulting the detachments of the right wheel and the nose wheel, damaging wings, elevator, nose and propeller, thus causing the accident. (e) Soon after the first impact of the right main wheel, the nose wheel of the aircraft also contacted the runway surface by impacting hard which made similar tyre-marks on the runway surface. (f) At this stage, the IP took over the aircraft control, added full power in an attempt to go around and rather prematurely applied left bank to move the aircraft towards centre line of the runway. This resulted the aircraft to lift off by about 2-5 feet height momentarily followed by the left-wing tip of the aircraft striking the runway surface making dents and scratch marks on its under-surface and tip area. (g) Soon after liftoff, the aircraft came down in a stalled condition on the runway surface, close to the centerline with an angle of about 3-5 degrees left with the runway centerline. At this moment the IP decided to put the throttle back to idle to settle down on the runway. This time, the right main landing wheel impacted heavily on the runway surface, a second time, and sheared itself off from its strut-assembly, getting detached from the aircraft.

3. BODY

3.1 Factual Information

3.1.1 History of Flight

3.1.1.1 Flight number?	S2 AFK
3.1.1.2 Type of operation?	PPL-General Flying Check Flight
3.1.1.3 Last point of departure?	VGRJ, Rajshahi, Bangladesh.
3.1.1.4 Time of departure (Local or UTC)?	0843 UTC
3.1.1.5 Point of intended landing?	VGRJ, Rajshahi
3.1.1.6 Flight Preparation	The flight was a 'PPL-General Check Flight' for the SP. The flight comprised of general handling with medium to steep turns and stall recovery of the aircraft in the training area followed by circuit and landing in the airfield.
3.1.1.7 Description of the flight and events leading to the accident?	(a) The SP started his first flight with Galaxy Aviation Ltd on 05 October 2019. He has been consistently flying until 22nd March 2020. Thereafter, he had an absence of flying for about five (05) months as he flew on 22nd August 2020 and continued flying consistently until 31st August 2020. He had an absence of flying again for over four (04) months from 01 September 2020 until 05 January 2021 due to the prevailing COVID-19 pandemic situation and consequently due to less flying activity of the Academy. During the period of absence, the SP resided in Dhaka, hence was out of touch with flying training and associated procedures. (b) It may be mentioned here that, Galaxy Aviation Ltd has an 'Operations Policy' Number 18/2016, which specifies that a student pilot will be declared de-current if he/she remains absent from flying for two (02) months or more. The 'Operations Policy' provides instruction for the de-current SPs to undergo 02 hrs 'General Flying' (GF) flights to regain currency before starting scheduled training flights as per syllabus. (c) On 05 January 2021, the SP travelled from Dhaka to Rajshahi by a Commercial Airline Flight which arrived at VGRJ 0450 UTC. Thereafter, at 0610 UTC, the SP went on an Instrument flying (IF) for about 1:30 hrs which was followed by a running change for a 'Solo' Circuit Flight with a 'Safety Pilot' for 0:30 hrs. His next flight was for a 'Navigation Training Flight', which lasted for 0:55 hrs. Thus, the SP undertook three consecutive syllabus-based missions on the day of arrival to VGRJ without having followed the 'Operational Policy-18/2016, meant for regaining the flight currency. (d) Next day, on 06 January 2021, the SP flew a 'Solo-Navigation Flight'. On 07 January 2021, the SP went for the 'PPL-Navigation Check Flight' and passed the test. However, after the 'PPL-Navigation Check Flight' the Flight Instructor gave some aircraft handing to SP in view of the upcoming 'PPL-General Check Flight', to be conducted soon after. However, the 'General Flight' performance by the SP was observed as 'Unsatisfactory' by the Instructor Pilot. (e) On 09 January 2021, the IP took up the SP for the 'PPL-General Flight Check' as per the approved syllabus, outlined in Appendix-D of the 'Training and Procedure Manual' of the Academy. This specific 'Test, included the conduct of an Oral Examination of Emergency Procedures, Pre-flight preparation and flight checks of 'General Airmanship maneuvers en-compassing steep turns, incipient spin, forced landing practice after engine failure, re-joining circuit procedure, normal powered approach and landing, alternative landing (one or more selected from 'Zero-Flap', precautionary, crosswind), go-around from low-level and followed by basic instrument flying.

	(f) The 'PPL-General Flight Check' was planned and was executed by ignoring the unsatisfactory performance of the SP's 'General Handling' part of the previous flight. The aircraft S2-AFK was on another navigation training flight by another trainee which took off from VGRJ at 0656 UTC and landed at VGRJ at 0712 UTC. There was some time-involvement for the flight crew to take lunch at the Academy premises, under the arrangement of the Galaxy Aviation. The subject-mentioned flight was started at 0831 UTC, took off at 0843 UTC and the first attempted landing time was at 0906 UTC, when the accident occurred. The flight time was 0:23 hrs from take-off to first attempted landing. (g) The aircraft was started around 0835 UTC and got airborne at 0843, initially for a general flying at 1500 feet AGL that included a few 15–45-degree bank turns, stalls etc. After about 15 minutes of aerial works, the SP was instructed by the IP to join the circuit for a Zero-Flap landing at RW 35 followed by a 'Touch & Go'. The SP followed the instruction and attempted the approach and Touch & Go procedure. According to the IP, the SP's final approach was a bit steeper than normal with about 70-75 knots of IAS. The aircraft crossed the Runway threshold at about 55 feet AGL. At this time, as per the IP, the aircraft started drifting to the right when the IP advised the SP to go left towards the centre line. During this process the right main wheel touched heavily on the right half of the runway centre line. (h) At this stage, the instructor pilot took over the aircraft control, added full power in an attempt to go around and applied left bank prematurely to move the aircraft towards centre line of the runway. This resulted the aircraft to lift off by about 2-5 feet height momentarily followed by the left-wing tip of the aircraft striking the runway surface and thereby making dents and marks on its under-surface and tip area. Thereafter, the aircraft stalled and fell on the runway surface causing the accident.
3.1.1.8 Reconstruction of the significant portion of the flight path?	 
3.1.1.9 Location (latitude, longitude, elevation)?	VGRJ (Shah Makhdum Airport), Rajshahi, Bangladesh (a) Latitude: N 242619.36 (b) Longitude: E0883658.56 (c) Elevation: 55 Feet
3.1.1.10 Time of the accident (Local or UTC)?	0906 UTC (1506 LT)
3.1.1.11 Whether day/night?	Day

3.1.2 Injuries to Persons

Injuries	Crew	Passenger	Others
3.1.2.1 Fatal?	No	N/A	N/A
3.1.2.2 Serious?	No	N/A	N/A
3.1.2.3 Minor?	No	N/A	N/A

3.1.3 Damage to Aircraft (Brief description)

3.1.3.1 Destroyed? — No

3.1.3.2 Substantially damaged? — Yes, as described below:

S/N	Nomenclature	Part No.	Figure No. from IPC	Page No. of IPC
01	Propeller Assembly (McCauley)	C16001-0501	60-1	231
02	Lycoming Engine Type/Model: O-235-L2C	6479 S/N: RL-15337-15	61-1	248
03	Mount Assembly Engine	0451003-36	62-6	248
04	Tube-Inner (Nose Gear Shock Strut)	0543006-5	34-10	129
05	Nose Gear Steering Left Hand and Right Hand	0543022-3 0543022-4	33-5	125
06	Exhaust Assembly	0454011-1	64	259
07	Cowl Assembly Lower	0452233-6	61B-27	239
08	Spring Assembly- Right Landing Gear	0441212-6	38-1	135
09	Hydraulic Line Assy. Brake- R/H	0400311-108	38-8	135
10	Wind Shield Assembly	0413419-201	32-1	123
11	Window Rear	0412020-10	30-79	118
12	Door Assy- Cabin R/H	0417008-34	41-1	145
13	Stabilizer Assembly	0432001-59	18	71
14	Rib Wing Center Section STA 192 (Wing Tip L/H)	0720608-7	6-25	37
15	Stringer 0 AFT Outboard (Wing Tip L/H)	0523003-40	6-54	38
16	Tip – Wing (Standard) L/H	0423008-3	6-73	38
17	Skin Lower Center Sec. (Wing tip L/H)	0523003-83	6-61	38
18	Skin Upper Section (Wing Tip L/H)	0523993-81	6-56	38
19	Skin Lower - L/H & R/H	0413004-35 & 0413004-36	27-10 27-11	105
20	Skin Lower (Rear Spar Bulkhead)	0412020-7	30-83	119
21	Elevator (Right Hand)	042001-52	21	83
22	Cover Assy – Fuel Tank (Left Hand)	0412020-7	03-14	25
23	Power Supply -Strobe Light	C622008-0102	03-50	26
24	Stiffener- Bulkhead (Right Hand)	0410127-2	25-35	97
25	Sill- Door (Lower Right Hand)	0410132-4	25-22	97
26	Floorboard Assembly	0410238-1	25-38	99
27	Stiffener- Belly Skin Outboard (Right Hand	0411953-3	25-64	99
28	Akin Fuselage Station 27.92 to 56.69)	041126-5	25-67	99
29	Wheel Assembly – Main Gear	C163001-0104	40	143
30	Wheel Half Assembly Male & Female	161-04900 & 06204700	40-1 & 2	143
31	Wheel Assembly – Nose Gear	1241156-12	36	132
32	Bulkhead – station 49.69	0411951-10	26-1	103
33	Bulkhead Lower- station 56.69	0411951-8	26-2	103

	34	Support- Main Landing Gear Right Hand (Outboard)	0441209-2	26-4	103
	35	Line Assembly Fuel (Right Hand)	0400343-8	81-10	319
3.1.3.3 Slightly damaged?	N/A				
3.1.3.4 Other damage?	N/A				

3.1.4 Damage to Runway

3.1.4.1 Details of Damage to Runway?	(a) Deep tyre marks could be visible on the surface of the runway; (b) About 10-feet-long x 1-inch-deep bitumen cut-mark on runway surface, resulted following the right wheel detachment; (c) About 2-feet-long x 1.5-inch-deep bitumen cut mark on runway surface, resulted following the nose wheel detachment and friction by the aircraft engine's exhaust pipe; (d) Several prominent bitumen cut-marks on runway surface due to propeller hits; (e) A few surface areas of the runway were scratched as a result of strikes by the aircraft wing tips and elevator surfaces.

3.1.5 Personnel information

3.1.5.1 Pertinent information concerning each of the flight crew members regarding age, validity of licenses, ratings, mandatory checks, flying experience (total and on type) and relevant information on duty time?	**Pilot in Command** (a) Date of Birth: 20 October 1985 (b) Age: 35+ years (c) Nationality: Bangladeshi (d) License: CPL No-616 (e) Ratings: IR, FIR, C-152, C-172 & PA-28 (f) Mandatory Checks: N/A (g) Flying Experience (Total): 1970:00 hours (h) Flying Experience on type: 1258:20 hours (i) License Validity: Valid (Non-Expiry) (j) Medical Status: Valid till 30 September 2021.	**Student Pilot** (a) Date of Birth: 27 July 1993 (b) Age: 27+ years (c) Nationality: Bangladeshi (d) License: SPL No-198 (e) Ratings: N/A (f) Flying Experience (Total): 48:30 hours (g) Flying Experience on type: 48:30 hours (h) License Validity: 24th September 2021 (i) Medical Status: Valid till 17 February 2024.
3.1.5.2 Brief statement of qualifications and experience of other crew members?	N/A	
3.1.5.3 Pertinent information regarding other personnel, such as air traffic services, maintenance, etc., when relevant?	**Air Traffic Services** (a) Air Traffic Controller - 02; (b) Aerodrome Operator - 01; (c) Fire Fighter - 05; (d) Crash Tender – 01, was available but was found having water leakage at various points; (e) Fire fighter dress – 05 sets available (03 in good condition, but 02 in poor condition); (f) Walkie Talkie set for communication was available; (g) Emergency drill practice - weekly 03 days; (h) Fire Observation Tower – Available, but not manned.	**Maintenance Services** (a) Wind-sock, Runway 35 was not effective; (b) Wind-sock, Runway 17 was effective; (c) A lot of pebbles in the middle portion of the Runway surface observed.

3.1.6 Aircraft information

3.1.6.1 Brief statement on airworthiness and maintenance of the aircraft (indication of	(a) The Aircraft Cessna Model-152 Registration No. S2-AFK has completed 11706.25 Hrs on 09 January 2021. The aircraft was manufactured in February 1979 and was registered in Bangladesh on 31 August 2010. (b) The Check-I was carried out from 13-15 December 2020, vide Work Order No GFA/57/20

deficiencies known prior to and during the flight to be included, if having any bearing on the accident)?	dated 13 December 2020; (c) The Maintenance Release was issued vide No. 06/2020. (d) This maintenance release is valid for 60 days up to 12 February 2021 or 100 flight hours, whichever occurs earlier. (e) The next maintenance release is due on 13 December 2021 or total aircraft time (TAT) 11799:00 Hrs, whichever comes first. (f) Quality assurance was carried out on 15 December 2021 by the Company Quality Assurance Manager. (g) The aircraft Cessna S2-AFK carried out two missions on 09 January 2021. (h) The origination (pre-flight) check was duly carried out by the licensed engineer and went for first mission for 1:25 Hrs. (i) The aircraft was again prepared for next mission by carrying out transit check (through flight) and handed over for the flight crew. (j) As per maintenance log, there was no defect known prior to and during the flight. (k) As per the document, no airworthiness directives/service bulletins were due to this aircraft. (l) The certificate of airworthiness of the aircraft Cessna-152, S2-AFK has been renewed by CAAB and is valid till 28 October 2021.
3.1.6.2 Brief statement on performance, if relevant, and whether the mass and centre of gravity were within the prescribed limits during the phase of operation related to the accident. (If not and if of any bearing on the accident give details.)?	The mass and centre of gravity of the aircraft didn't have any bearing on the accident.
3.1.6.3 Type of fuel used?	100 LL Grade Aviation Fuel (Blue) and 100 (Formally 100/130) Grade Aviation Fuel (Green)

3.1.7 Meteorological information

3.1.7.1 Brief statement on the meteorological conditions appropriate to the circumstances including both forecast and actual conditions, and the availability of meteorological information to the crew?	(a) Surface Wind: Calm; (b) Vis: 2.5 Km; (c) Cloud: Scattered NSC; (d) QNH: 1009.8 MB; (e) Temp: 26 Degree C (f) Crew received the Met Information. (g) Hourly weather forecast is available at weather office at VGRJ Terminal Building.
3.1.7.2 Natural light conditions at the time of the accident (sunlight, moonlight, twilight, etc.)?	Sunlight.

3.1.8 Aids to navigation

3.1.8.1 Pertinent information on navigation aids available, including landing aids such as ILS, MLS, NDB, PAR, VOR, visual ground aids, etc., and their effectiveness at the time?	(a) NDB RJ 228 KHZ H24 242632.87N 0883649.35E (Serviceable); (b) DVOR RAJ 114.6 MHZ H24 242621.18N 0883654.10E (Serviceable); (c) VORDME RAJ 1180 MHZ H24 242621.18N 0883654.10E (Serviceable); (d) VASI: Available on both RWY. (e) Wind Sock: Serviceable on RWY 17 side; Unserviceable on RWY 35 side.

3.1.9 Communications.

3.1.9.1 Pertinent information on aeronautical mobile and fixed service communications and their effectiveness?	Aerodrome Control Service Rajshahi Tower 128.3 MHZ - Tower communication equipment was reported to be serviceable.

3.1.10 Aerodrome information

3.1.10.1 Pertinent information associated with the aerodrome, facilities and condition, or with the take-off or landing area if other than an aerodrome?	(a) VGR ARP co-ordinates AD 242619.39N 0883658.56E; (b) Distance and direction from city 07 KM North of Town; (c) AD elevation / reference temperature 55FT/400 C; (d) MAG VAR 50' W;

3.1.11 Flight recorders

3.1.11.1 Location of the flight recorder installations in the aircraft, their condition on recovery and pertinent data available therefrom?	N/A (Not installed)

3.1.12 Wreckage and impact information

3.1.12.1 General information on the site of the accident and the distribution pattern of the wreckage, detected material failures or component malfunctions. (Details concerning the location and state of the different pieces of the wreckage are not normally required unless it is necessary to indicate a break-up of the aircraft prior to impact. Diagrams, charts and photographs may be included in this section or attached in the appendices)?

(a) The aircraft made the first contact with the runwayat approximately 1500 feet down RWY 35 on to the right half of the centre-line at an angle of about 3-4 degrees with the RWY centre-line track (Figure-1).

(b) First Touch-Down Tire Marks indicated a partial dislocation of the right wheel after its heavy touch- down. There was no aircraft part or wreckage found in this area (Figure-1).

(c) The second impact of the right wheel, when ditached, made prominent cut-mart on the runway bitumen as a result of the broken strut that scratched through the runway bitumen. However, there was no aircraft wreckage found in that area (figure-2).

(d) On impact of the nose-wheel, the aircraft engine exhaust pipe-edge cut through the runway bitumen that left prominent scar-mark on the runway surface. The detachmeent of the nose whell left a broken clamp-part resting 5-7 feet beside the impact area. The impact of the aircraft propeller also left series of cut marks on the bitumen. However, the propeller tips got bent and left no debris in that area (figure-3).


(Figure-1)


(Figure-2)


(Figure-3)

(e) The detached right main wheel tire, after detachment, frictioned with the runway surface for about 10-15 feet, making prominent scratch-mark on the runway surface betumen. The detached part thereafter rested about 20 feet near about the centr-line of the runway on to the north (Figure-4).

(f) The detached nose wheel rested behind the disabled aircraft, about 15-20 feet, on to the west of the runway centre-line (Figure-5).

(g) The disabled aircraft, pivoted around the broken right wheel strut, stopped at the western half of the runway centre-line, at an angle of about 45 degrees with the runway track, facing 'North-east' (Figure-6).


(Figure-4)


(Figure-5)


(Figure-6)

3..1.13 Medical and pathological information

3..1.13.1 Brief description of the results of the investigation undertaken and pertinent data available therefrom?	N/A (since no personal injury was evidenced).

3.1.14 Fire

3.1.14.1 If fire occurred, information on the nature of the occurrence, and of the firefighting equipment used and its effectiveness?	There was no evidence of fire.

3.1.15 Survival aspects

3.1.15.1 Brief description of search, evacuation and rescue, location of crew and passengers in relation to injuries sustained, and failure of structures such as seats and seat-belt attachments?	N/A

3.1.16 Tests and research

3.1.16.1 Brief statements regarding the results of tests and research?	a) The damaged specimen Spring Assembly-Right Landing Gear Part Number: 0441212-6 was sent to Local NDT (Non-Destructive Test) facility. NDT experts opined that no positive result could be obtained of this damaged specimen as it had already broken in to two pieces. b) On the very first day that is on 10th January 2021 the team looked into the broken area of the damaged specimen through magnifying glass and found that in both broken ends were shining and there was no symptom of dullness in those portions thereof. This means that the spring assembly was broken instantaneously during the second touchdown. c) To find out the root cause of the failure, the AAIT sent the damaged Spring Assembly Landing Gear RH, Pt No. 0441212-6 & AXLE- Main landing gear Attaching Parts, Pt No 0441203-1 for 'Material Test' in the laboratory of National Transportation Safety Board (NTSB), 490L 'Enfant Plaza, SW Washington, DC 20594, USA on 23 January 2022. d) The NTSB carried out the 'Material Test' in the laboratory of National Transportation Safety Board (NTSB) and sent the test report on 31 March 2022. The details of the test report are given below: "As received photographs of the lower portion of the right main landing gear (RMLG) are shown in figures 1 and 2. The RMLG fractured at the lower portion of the tubular strut assembly in the general area of the torque plate. The fracture was oriented generally in the transverse direction. The tubular strut also contained 3-inch longitudinal cracks on diametrically opposite sides that extended from the transverse fracture. These pieces were ultrasonic cleaned with alconox, a detergent that removes iron oxide from ferrous metal. Bench binocular microscope examination of the fracture faces revealed coarse texture fracture on slant planes consistent with overstress separation. The fracture faces showed no evidence of fatigue cracking".

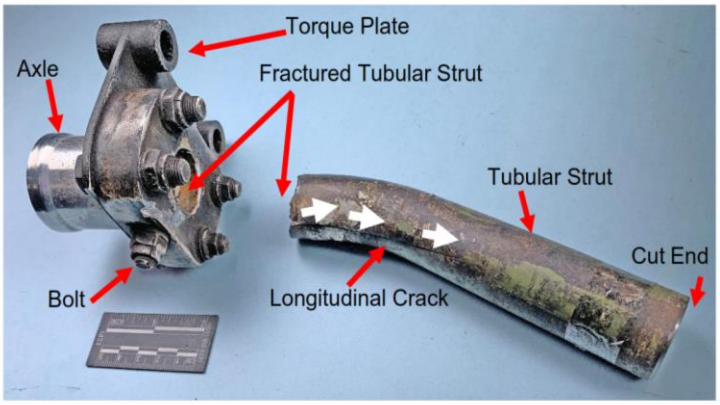


Figure 1. As-received lower portion of the RMLG assembly showing the axle, torque plate for the brake assembly, and mating fractures of the tubular strut (spring assembly). The longitudinal crack propagated in the general direction indicated by white arrows.

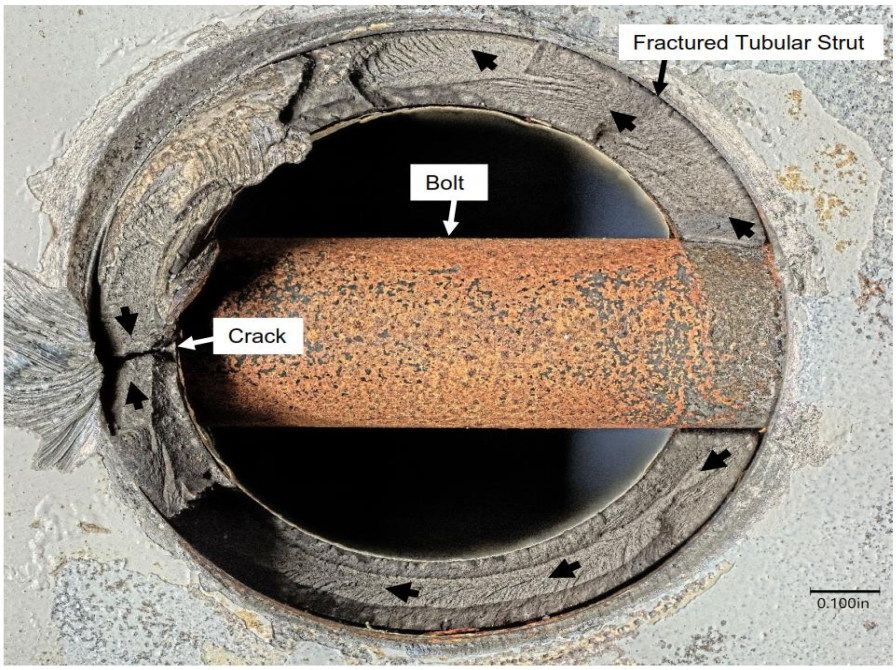


Figure 2. Fracture face of the tubular strut after cleaning with Alconox showing the general direction of fracture propagation (indicated by arrows). This is the fracture face on the side of the axle.

3.1.17 Organizational and Management information

3.1.17.1 Pertinent information concerning the organizations and their management involved in influencing the operation of the aircraft. The organizations include, for example: the operator; the air traffic services; airway, aerodrome and weather service agencies; and the regulatory authority. The	(a) Galaxy Flying Academy (GFA) is one of the CAAB approved flight training organizations in Bangladesh. It was established on 08 June 2008 as private limited company. It started its training operation from 29 October 2010. (b) It provides the following courses: (1) Private Pilot license- PPL (2) Commercial Pilot License (CPL) (3) Instrument Flying

information could include, but not be limited to, organizational structure and functions, resources, economic status, management policies and practices, and regulatory framework?	(4) Flying Instructors Rating (c) The ground classes are conducted in Dhaka while the flying training is carried out at VGRJ (Shah Makhdum Airport, Rajshahi). (d) Until the day of the occurrence, the Academy had 02 Cessna-172 R and 03 Cessna-152 aircraft for the training of the students. Out of the 03 Cessna-152, the subject mentioned aircraft, S2-AFK made the accident on 09 January 2021. (e) The company is having 5 key post-holders such as, the Managing Director, Chief Executive Officer, Chief Flight Instructor, Chief Engineer (Maintenance Manager) and Quality Assurance Manager. The Chief Executive Officer is the Accountable Manager. (f) On the day of the occurrence, the Academy had total student strength of 154 SPs that included SPs seeking for PPL, CPL FIR licenses. The academy has trained more than 200 students so far. There are 4 flying instructors, 3 Engineering executives and 05 ground instructors. (g) Galaxy Flying Academy Limited is also a CAAB approved 'Aircraft Maintenance Organization' (AMO), which uses their own hanger, located at Rajshahi airport, for aircraft maintenances with their own man power. (h) The main source of revenue is earned by Galaxy Flying Academy from the training of the students.

3.1.18 Additional information

3.1.18.1 Relevant information not already included in 3.1.1 to 3.1.17?	(a) The SP did not fly from 23 March until 21 August 2020 and again from 01 September to 31 December 2020, as such did not have consistency in flying. (b) As per the 'Operations Policy' Number 18/2016, the SP was de-current. (c) The organization did not have the Operational Policy to regain the currency of the de-current SP. (d) The Instructor Pilot did not follow the flying procedure to conduct the SP's 'PPL General Flight Check'. (e) The company does not have any procedure for no-flap go around.

03.1.19 Useful or Effective Investigation Techniques

3.1.19.1 When useful or effective investigation techniques have been used during the investigation, briefly indicate the reason for using these techniques and refer here to the main features as well as describing the results under the appropriate subheadings 3.1.1 to 3.1.18?	(a) The investigation techniques used by the AAIT in conducting this investigation have been adopted as per the instructions provided in ICAO Annex-13, Appendix-1, Para-1.19 and that of Doc-9756, Part-4, Para-1.19. (b) So far, no new useful or investigation technique has been merged at this stage of the investigation other than what is mentioned in (a). However, should the AAIT use any new useful or investigation technique, the same will be included through 3.1.1 to 3.1.18 in the investigation 'Final Report' and/or, will include as an Appendix to the 'Final Report', as specified in ICAO Doc-9756, Part-4, Para-1.19.

3.2 ANALYSIS

The following analysis has been made based on the information documented in **'Factual information'** and which is relevant to the '**Determination of Conclusions'** and **'Causes and/or Contributing Factors'.**

3.2.1 Man

3.2.1.1 Man?	**Instructor Pilot (IP)** (a) Has the responsibility as Chief Flying Instructor (CFI) of Galaxy Aviation Ltd to ensure Regulatory and Company compliance with regard to flight crew training; (b) Had a record of consistency in flying in recent time; (c) As CFI, he was found not conforming with the requirements outlined in the Company Operations Order 18/2016 to be fulfilled by the SP on the occasion of de-currency on flying and other procedures, mentioned in 3.1.6 (b); (d) Was non-serious about the 'Unsatisfactory' performance in GF of the SP on the preceding flight. The SP could have been subjected to at least another flight, to improve upon GF handling performance prior to a Check flight; (e) Was found to take up the SP for the flight without having given adequate 'Pre-flight Briefing'; (f) Was not mindful that, after a long period of absence from flying, he undertook the SP for majority of flights involving 'straight-and-level type' only (Instrument & Navigation flying); (g) Asked the SP to proceed for a 'Zero-Flap' touch-and-go landing' at the very first approach of the check flight, which could have been given during subsequent approaches as viewed with the 'PPL-GF Check' syllabus; (h) Could take earlier decision to 'Go-around' the aircraft no sooner it started drifting to the right; (i) Left-banked the aircraft during 'Go-around' thus augmenting the aircraft stalling condition to the extent of hitting the RWY surface which should have been avoided considering the aircraft speed being low. (j) Could possibly took the first 'Flap' (10 degrees), which could decrease the stalling speed of the aircraft. This could possibly improve the situation.
	Student Pilot (SP) (a) With regard to flying-currency, the SP was in-consistent. One of the two aspects that hindered for the in-consistency was the prevailing COVID-19 pandemic situation and the other was due to fulfilling the obligation of passing the Civil Aviation PPL-Examination in Dhaka; (b) Was out of current on flying, but instead of complying with the 'Operations Policy-18/2016 of the company, the SP agreed to undertook the syllabus-based training which was non-conformance with company instruction.
	Air Traffic Controller (a) VGRJ has two ATC Controllers. While one controller remains on-duty, the other controller remains off-duty. On the day of the accident, the duty controller gave take-off clearance to the aircraft and was on a lunch-break inside the Air Traffic Controlling room; (b) At the time when the aircraft S2-AFK transmitted to ATC for rejoining for 'Circuit-and-landing', one 'Aerodrome Operator' was on the ATC 'Hot-seat' and was controlling the aircraft movement. This has been the regular practice being adopted by the ATC of VGRJ; (c) An un-authorised person like the 'Aerodrome Operator' made all replies to S2-AFK from the time it intended to join the circuit until it requested to make the 'Touch-and-go' landing. The 'Touch-and-go' landing clearance to S2-AFK was also given by the 'Aerodrome Operator'. To the extent, the 'Aerodrome Operator' remained on 'Hot-seat' till the 'Mayday' call was given by the flight crew following the accident. However, specific to the replies given by the 'Aerodrome Operator', the AAIT did not find any abnormality other than 'Regulatory' violation;

	(d) The post-accident activities by the Duty Air Traffic Controller of VGRJ with regard to 'Emergency Responses' and 'Communication Procedures' were satisfactory.
	Company Maintenance Engineer (a) From the aircraft Logbook, it was evident that the aircraft was pre-flighted (Origination Check) by the licensed engineer and declared airworthy for flight. (b) On 09 January 2021, following completion of the first mission, the aircraft was made ready for the subject mentioned flight by carrying out the required Transit Check. The aircraft was airworthy and there was no reported defect. (c) The periodic inspection-I was carried out from 13-15 December 2020 and the maintenance release was done by the licensed engineer on 15 December 2020. (d) The Airworthiness Directive (AD) No 2011-10-09 was carried out on 15 December 2020. No AD/SB was reported 'due' to this aircraft. (e) There are 2 licensed engineers including Chief Engineer (Maintenance Manager). Only during periodic inspections or emergency situations, the Chief Engineer (CE) moves to VGRJ, otherwise he remains in Dhaka office. (f) All maintenance activities are carried out at Rajshahi. One Quality Assurance Manager, who is a CAAB Approval Engineer, visits VGRJ twice in a month and/or during periodic inspection.

3.2.2 Machine

3.2.2.1 Machine?	The aircraft engine, airframe including landing gear and other aircraft systems were reported to be satisfactory.

3.2.3 Environment

3.2.3.1 Environment?	Not contributary with this accident

3.2.4 Organizational Aspect

3.2.4.1 Organizational Aspect?	(a) Galaxy Flying Academy possess standard operation procedure, training and procedure manual, checklist, Pilot Handbook, operational order etc. But no one was found be accountable to see that those instructions outlined in the documents are followed. (b) The Organization did not keep track of the absence of flying of the SP; (c) As per the 'Operations Policy' Number 18/2016, the SP was de-current to which the Organization remained unconcerned. (d) The organization lagged in implementing the flying Operational Policy to regain the currency of the de-current SP. (e) Organizational supervision was absent that rendered the IP not follow the flying procedure to conduct the SP's 'PPL General Flight Check'. (f) The Company did not have any procedure for no flap go around. (g) No currency flight was given to SP as per flying Operational Policy.

3.3 CONCLUSIONS

Listed below are the findings, causes and/or contributing factors established in the investigation. The list of causes and/or contributing factors include both the immediate and the deeper systemic causes and/or contributing factors.

3.3.1 FINDINGS

3.3.1.1 Findings?	(a) After flare out, the aircraft started drifting to the right of the runway centerline, which was neither corrected by the SP nor the IP in time; (b) Inadequate corrective action on the drifting of the aircraft and late take-over of the aircraft control by the IP caused the right landing gear wheel made a very hard contact with the runway surface first resulting in partial dislocation of the wheel from its adjoining strut; (c) Following the initiation of the 'Go-around' and after a momentary airborne, the aircraft stalled and came down on the runway concrete making a second heavy-impact on the same wheel. At this, the right wheel completely detached from its strut assembly; (d) The stalled condition of the aircraft also made the nose wheel of the aircraft to fall viciously on the runway surface resulting the wheel to detach; (e) The eventual detachment of the nose wheel damaged the engine propeller tips and cowlings of the aircraft due to ground-impact; (f) Faulty handling of the aircraft during landing appeared to be the significant finding in the investigation; (g) Absence of Company procedure for no flap go around.

3.3.2 Causes

3.3.2.1 Causes?	Faulty handling of the aircraft by the flight crew following flare out and landing.

3.3.3 Contributing Factors

3.3.3.1 Contributing Factors?	(a) Procedure for following the company policy to gain recurrency for decurrent pilots was not followed; (b) Asking the SP to make flapless 'Touch & Go' by the IP after the SP returned to flying after a long gap and not considering his preceding flight performance being un-satisfactory; (c) Insufficient anticipation and erroneous technique used by the flight crew while the aircraft drifted following flare out for landing; (d) Delayed action by the IP to take over the aircraft control; (h) Improper pilot technique followed to recover the aircraft from an incipient stall, especially after flare out (5-10 feet) wherein the IP gave undue left-bank input, resulting the left wing to hit the ground as well as aggravating the existing stalling condition; (i) Absence of procedure for no flap go around.

3.4 SAFETY RECOMMENDATIONS

3.4.1 Intermediary Safety Recommendations

3.4.1.1 Details of Intermediary Safety Recommendations?	N/A

3.4.2 Safety Recommendations

3.4.2.1 Details of Safety Recommendations?	**(a) Applicable for Galaxy Flying Academy:** 1. Galaxy Flying Academy is advised to follow meticulously the standard operation procedure, training and procedure manual, checklist, Pilot Handbook, operational order. 2. Galaxy Flying Academy is to ensure that the existing procedure for gaining the flying currency for all pilots should be followed strictly; 3. Special emphasis should be given by the company to ensure that pilots, especially the IPs should achieve high degree of proficiency in recovering the aircraft from any unusual flight condition, such as incipient or full stall (clean or dirty); 4. All Instructor Pilots should ensure to carry out pre-flight briefing prior to each training flight and de-briefing after the flight and maintain records of them; 5. IPs of Galaxy Aviation should master Instructional Training Technique so as to ensure that, in critical phases of flights such as take-off and landing, they are able to demonstrate sharp anticipation and quick decision to take over the control of the aircraft into safety. 6. The Company manual should lay down concrete procedure for go-around from zero-flap approach and the procedure should be skillfully practised and mastered by the IPs and SPs. **(b) Applicable to the Civil Aviation Authority of Bangladesh (CAAB):** 1. The safety oversight by the Civil Aviation Authority of Bangladesh may be strengthened on Galaxy Flying Academy Ltd for enhancement of safety; 2. Action may be taken with regard to the crash tender located at VGRJ to be fully serviceable and operational; 3. Appropriate fire-fighting dresses should be provided to all fire fighters located at VGRJ to avoid physical injury during firefighting; 4. The Fire Observation Tower at VGRJ should be manned during operational hours.

4. APPENDICES

4.1 All evidences, documents, photographs etc., will be preserved in 'File'

END