

FINAL REPORT  
CESSNA -152 AIRCRAFT ACCIDENT INVESTIGATION IN BANGLADESH

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FINAL REPORT  
Aircraft Cessna-152; Training Flight Call Sign S2-ADI  
Shah Makhdum Airport, Rajshahi, Bangladesh



Cessna-152 Aircraft of Flying Academy & General Aviation Ltd.

This is to certify that this report has been compiled as per the provisions of ICAO Annex 13 for all concerned.

The report has been authenticated and is hereby Approved by the undersigned with a view to ensuring prevention of aircraft accident and that the purpose of this activity is not to apportion blame or liability.

A handwritten signature in black ink, appearing to read 'p. Salahuddin'.

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**0. SYNOPSIS:**

- a) A Cessna-152 aircraft met with an accident on 01 April 2015 while on a training flight at a local Airport in Bangladesh. On board were two pilots, one the Instructor Pilot (Flight Instructor) and the other was a Trainee Pilot (Student Pilot) who was to undergo post solo training. The accident resulted in a crash. The point of impact was adjacent to the Runway on the grassy area. The aircraft caught fire on impact killing the Trainee Pilot and seriously injuring the Instructor Pilot. An Investigation was conducted as per the procedures laid down in Annex 13 and the associated DOCs of ICAO and the report was made as per Chapter 6 and associated Appendix of Annex 13 and Part IV of Doc 9756 AN/965 Manual of Aircraft Accident and Incident Investigation.
- b) The Flight Instructor was demonstrating a low altitude practice forced landing to the student pilot. He made an early right turn after take-off towards the right down-wind position to land on the opposite runway. The altitude was so low and the down-wind position so close that before the aircraft could complete the reciprocal turn and could come over the runway, it made the ground impact adjacent to the runway edge and caught fire instantaneously after the final impact. Student pilot succumbed on the spot to the impact force and post impact fire. Instructor pilot survived with severe burn injury only to succumb after 43 days. Aircraft was completely destroyed due to the impact force and post impact fire.

**1. BODY (FACTUAL INFORMATION)**

**1.1 Introductory Information:**

- a) After the winter weather spell, the Flying School resumed its flying activities in early February 2015. The weather condition of the day was fair with surface wind around 10 knots and surface temperature 33 degrees Celsius. The Instructor Pilot was appointed as an honorary flight instructor by the Flying School in October 2014. While working for the flying school the Flight Instructor got a job in a private cargo airlines, to be trained on SAAB-340 aircraft. He was scheduled to proceed abroad for SAAB-340 simulator training sometime in the month of April 2015.
- b) The flying school did not have any senior instructor to conduct necessary checks and to take skill tests for the students at the time. Hence, this Flight Instructor was offered for his services to the flying school to conduct the checks and tests before he would leave for his training abroad. Accordingly, upon the request made by the flying school he commenced flying from 29 March 2015, limiting services up to 5 days at a time.
- c) The Flight Instructor flew a cross-country flight on the 29 March 2015 and thereafter, conducted five further flights, logging 05:00 flying hours.
- d) Next day was his weekly off day, as such there were no flying activities on 30 March in the flying school.
- e) Training, as usual, resumed in the morning of 31 March. The Flight Instructor commenced flight training at 0910 hours local time and conducted eight training flights with eight different students,

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using two similar aircraft, ending his last landing of the day at 2100 hours local time, logging a total of 07:50 flying hours.

- f) Next morning, on 01 April, he resumed flight training at 0915 hours local time and carried out three check flights. He then changed aircraft and took the incumbent Trainee Pilot up for a routine training flight that met with the subject mentioned accident.
- g) The investigation team visited the accident site and started its activities immediately following the accident. Notification to all concerned were made as appropriate and a preliminary investigation report was prepared.
- h) The Investigation team made several visits to the accident location and site and carried out the in-depth investigation. While conducting the investigation in its usual way through collection of statements from various witnesses and interrogations of the witnesses, a few eye witnesses were interviewed who provided important information and supplied a video which helped to solve many unanswered questions. Additionally, the interviews provided important information of the accident, particularly regarding ATC and Aerodrome Rescue and Fire Fighting services.

### **1.2 Impact Information:**

- a) Initial ground impact point was identified at 1900 ft. from the TH of the RW and 5 ft. from the runway edge. 2 ft. ahead and about 2 ft. left of it a sliding and turning marking to the left was seen on the ground. This sliding marking was about 13 ft. long. Another marking about 10 ft. ahead and right of the initial impact marking was seen. This ground mark was about 15 ft. long, turning to the left with slightly deeper marks. These three marks together have been considered as the initial impact point.
- b) Second impact was seen at 1935 ft. from RWY TH and 12 ft. from the runway edge, about 10 ahead and left of the end of 15 ft. mark of the initial impact. This ground marking had a sharp edge cutting mark which slid through the ground for about 25 ft. About 8 ft. abeam of the end of the slid mark towards the runway lay a piece of wing tip sharply pierced through the ground.
- c) Thereafter the aircraft hit the ground damaging an area about 6 ft. in length and 2.5 ft. in width 15 ft. from the end of earlier slid mark and about 4 ft. to the right. This impact point was considered as impact point 3. A mark on ground could be seen about 25 ft. forward and slightly to the right. Broken nose wheel assembly laid 4 ft. behind it. And few pieces of shattered wind shield laid about 25 ft. ahead and right from the broken nose wheel.
- d) Up to the 3<sup>rd</sup> impact point the a/c generally moved parallel to the direction of the RW. The final impact point lay 80 ft. from there veering about 120° and resting 47 ft. east of the edge of the runway and 2069 ft. from the RW 35 TH. On the final impact the a/c literally disintegrated having the fuselage breaking from the cockpit fire wall, right wing lay partly severed from the root, outer portion trailing behind. Left wing completely severed and detached having its outer part moving forward indicating still a veering movement at the final impact. Aircraft engine portion detached from the fuselage and rested yet veering further, confirming the rightward movement. Hardly any engine disintegration or burning was observed in the engine section. One blade of

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the propeller was found bent at an angle of about 90° from the midpoint. A broken fuselage piece from the cockpit outer ceiling lay about 12 ft. in front of the engine.

- e) Additionally, the right wheel was found sheared off from the tip of the spring leaf wheel assembly and the wheel was found across the runway to the other side about 400 ft. away from the initial impact point.

### 1.3 Protection and Recovery of Wreckage and Disposal of Diseased/Injured Persons:

- a) The wreckage was protected under the control of the IIC as per the procedures outlined in Annex 13 and the relevant DOCs of ICAO.
- b) Arrangements were made for the post-mortem of the diseased which was concluded as death due injury owing to severe impact and burn.
- c) On the day of accident, the Flight Instructor was brought by air to the Capital City (Dhaka) by at the quickest means and was admitted in the Combined Military Hospital (CMH) in the evening with severe burn injury. The Investigator-in-Charge (IIC) managed to obtain a brief but useful interview of the Instructor Pilot while he was admitted in Dhaka CMH. The condition of the Instructor Pilot was deteriorating very rapidly and was eventually air-ambulated for better treatment abroad where he succumbed to burn injury after 43 days of the accident.

### 1.4 Analytical information:

- a) There was no evidence of fire in flight or prior to the impact. Eye witnesses confirmed that fire started after ground contact. Fire broke out and spread immediately after the final impact.
- b) The Aerodrome had a standard fire vehicle (FV) capable of ejecting water-chemical mixture with manpower of three persons. It also has an ambulance and a pick-up van with drivers. All vehicles were serviceable and all manpower available at the station.
- c) According to the amateur video Fire Vehicle reached the spot after **03m 46s** and immediately started agent application. But the agent did not reach the burning aircraft. Application was stopped to reposition the FV. Finally, application in full swing commenced after **04m 26s**. Effectively, therefore, the response time was **04m 26s**. A test run was carried out to determine time required for the fire vehicle (FV) to reach the accident site using standard alerting system. The FV took **02m 49s** to reach and position for agent application.
- d) It took approximately **04s** to douse the smoke and further **06s** to stop the flames. The fire came under complete control in **1m**.
- e) Following impact, the Instructor Pilot was seen separating himself from the burning aircraft with severe burn injury.
- f) The ambulance reached the spot after **03m 48s**. It carried the Instructor Pilot to nearby CMH after **05m 15s**.

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- g) Once the fire was subsided by the Fire vehicle, the Trainee Pilot was found to have burnt to death. Aircraft cockpit and mid portion was completely burnt.
- h) There were only two fixed points found, mainly the starting point of the take-off (TO) run determined by several eye witnesses and the impacts points. All other necessary points needed to be determined through test flights, mathematical derivation, eye witnesses and aircraft (a/c) manual references. Test flights was carried out to determine take-off run and time it took to get airborne. Also that the aircraft flew for a very short period, it became necessary to determine air time, total and lateral distances it travelled, altitude gained and the bank angle required completing the reciprocal turn from a very close down-wind (DW) position until it first impacted on the ground. A test run was also carried out to determine response time of the Fire Vehicle.
- i) Several take-offs were carried out releasing brakes upon reaching full power, as is normally done. The results varied every time though environmental conditions were same, varying from 1050 ft. to 1170ft. This variation has been considered to be due to piloting technique. Under the circumstances, it has been decided by the IIC to consider take-off run to be **1100 ft.**
- j) Take-off starting point was established to be 360 ft. from the TH of RW by several eye witnesses. Take-off run was found out to be 1100 ft. So the take-off point was  $(360+1100) = 1460$  ft. from RW TH.
- k) Elapsed time from brake release to lift-off varied from 22s to 24s. The investigation team consented to consider average elapsed take-off time to be **23s.**
- l) As per ATC transcript aircraft brake release time was 13 58 27. It got air borne after 23s at 13 58 50. Aircraft crashed at 13 59 23. Therefore, the air time was determined to be **33s.**
- m) Initial impact point has been physically measured to be 1900 ft. from the TH of RW. Take-off point being 1460 ft. from the TH of RW, a/c travelled towards the DW position up to  $\{6000 - (1460+1900) = 3360\} = 2640$  ft. From DW position up to the initial impact time was **10s.** To travel **2640** ft. the a/c took  $(33 - 10) = 23$ s at an average GS of 67.96 kt, which was considered reasonable taking into account standard flying practice and the existing wind condition.
- n) After lift-off, aircraft afforded only **23s** to climb while flying towards DW position. Rate of climb could have been 655 ft./min at 33° C at SL once standard climb profile is established. However, since the aircraft did not have enough time to establish standard climb profile, test flights were carried out to determine maximum altitude that the aircraft could have gained in 23 seconds. During repeated test flights, it was found that in 60 seconds from the start of take-off run, i.e. in  $(60 - 23) = 37$ s aircraft could climb up to an average height of 250 ft. Therefore, in 23 seconds aircraft could have climbed up to **155 ft. AGL.**
- o) How far out did the aircraft travel on to the DW position before turning reciprocal was a factor to be resolved? The aircraft flew only for **33s.** Considering an average GS of **65 kt.** remaining consistent with the standard flying practice, a/c had traversed a total distance of 3623 ft. in 33s. It has already been established that on the DW the aircraft had travelled 2640 ft. in 23s. Hence, it was estimated that during the reciprocal turn it travelled  $(3623 - 2640) = 983$  ft. in an half circle

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descending flight path. According to the mathematical formula, the diameter has been determined to be 655 ft, the straight distance from the initial impact point to the furthest DW position.

- p) What bank angle was used for the aircraft to reach the spot aircraft first impacted was also a puzzle to be solved. As per C-152 SOP all turns in the circuit to be completed with rate one turn, maximum allowed 20° bank. In case of practice forced landing (PFL), while turning base 20°–25° bank is allowed. During repeated test flights, the aircraft was made to turn reciprocal from the calculated DW position with 15°, 20° and 30° bank at 70 KIAS. It took for the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> instances 42s and travelled about 3300 ft. away, 32s and about 2500 ft. away, 24s and about 1900 ft. away respectively from the beginning of the turning point until established on the reciprocal direction. Bank required in the actual scene was obviously more to complete the turn in 10 seconds. Further test flights were carried out to find out the bank necessary to complete 180° turn in 10s. According to the test flights reports it needed 15s to turn 180° with 45° bank. Therefore, it was established that an average bank angle of **more than 45°** was required to complete the reciprocal turn to land on the opposite RW.
- q) The Flying School is an Approved Training Organization (ATO), established in 1948, one of the oldest flying school in the sub-continent.
- r) This school runs by an executive committee elected every two years. A constitution is the basis of running the organization. This constitution is found to be adequate to run a conventional organization but not for a specialized organization like an ATO. Importantly, it did not contain certain fundamental requirements to run an ATO.
- s) The Flying School did not have any Accountable Manager (AM) and Head of Training (HT) required by the regulations until recently. However, the most important full time positions of CFI and CGI had been filled up by qualified persons. But unfortunately, the presence as CFI had not been felt for a long time. Statements of the School's management personnel reveal that CFI did not maintain sufficient control and supervision over the operations and flight trainings as required by the Training and Procedure Manual (TPM).
- t) The mismanaged situation ultimately gave rise to the appointment as Acting CFI of the Flying School who was involved in the ill-fated flight.
- u) The Flying School is an Approved Maintenance Organization (AMO) also. It has adequate number of qualified and certified Engineers and Technical staff. It is also equipped with proper tools and equipment for maintenance and servicing of a/c.

## 2. ANALYSIS

### 2.1 General

A Cessna-152 aircraft, operated by one Flying School of Bangladesh met with an accident on 01 April 2015 while conducting a training flight. The aircraft was making a low altitude practice forced landing, crashed outside the RW while coming to land from the opposite direction. Upon the final

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contact with the ground the aircraft caught fire killing the student pilot on the spot and the instructor pilot 43 days later of his burn injury while undergoing treatment abroad. The aircraft was completely destroyed.

## 2.2 Flight Operations and others:

- a) The Instructor pilot was an experienced pilot and instructor. His educational background was sound. He was a Master degree holder with good grades. He flew 07 different aircraft including Helicopters and logged 2107 hrs. of flying. He had more than 1000 instructional hours, mostly in C-152 a/c. Prior to this accident, he had been in another Flying School as its CFI in 2013.
- b) The Trainee Pilot passed A-Level in 2014 with good grades and had an experience of 6:40 hours flying till the accident.
- c) As per the TPM of the Flying School, students are taken for solo check before their first solo flight. This procedure was compiled on the previous day. It is also the procedure to fly a training flight before being allowed to operate the second solo flight. A training flight was built up on the day of accident for three Trainee Pilots per routine practice.
- d) The IIC concluded from the analysis of the ATC Tape that the Trainee Pilot was either was weak in RT or the incumbent was tensed.
- e) The IIC also concluded from the analysis of the ATC Tape that the Phraseology used and the expression made by the Instructor Pilot that day did not sound very normal. The IIC went on to conclude that it could be because the Instructor Pilot suddenly decided to do those exercises for which he himself was neither prepared nor did he brief the Trainee Pilot before. Incidentally, the Trainee Pilot was briefed about the Practice Forced Landing (PFL) by some other Instructor of the School and not the Instructor Pilot of the flight that met with the accident. The IIC exclaimed, since the Instructor Pilot, without any prior briefing to the Trainee Pilot thought, planned and explained the exercises to the Trainee Pilot just before take-off, he used those non-standard phraseology with lesser confidence.
- f) From the interview of the Instructor Pilot who mentioned, "Actually I turned early from the mid runway..." Gave fair indication to the investigation team the reason for the accident to occur.
- g) Having calculated the airborne time, the ground contact time and consequently the total air time in conjunction with the R/T communication from the Instructor Pilot it could be revealed that the aircraft commenced reciprocal turn at 23s after airborne.
- h) As per C-152 POH rate of climb at 33° C OAT at SL should have been 655 ft. at Vie of 67 KIAS. Accordingly, the aircraft should have climbed to 251 ft. in 23s. But it was not so. During test flights it was found that the initial climb rate was less than that. Upon airborne, the usual practice is to lower the aircraft nose to achieve Vie. As such the prescribed rate was not achieved during the initial part of the climb. During repeated test flights, it was confirmed that the aircraft could climb only 250 ft. in 37s. Therefore, it was ascertained that in 23s the aircraft had climbed to 155 ft. AGL before it commenced reciprocal turn.

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- i) The A/C lifted off 1460 ft. from TH RW and when it crashed made the first ground contact 1900 ft. from TH, RW length remaining therefore was  $\{6000 - (1460+1900) = 3360\} = 2640$  ft. distance it covered in down-wind in 23s at an average GS of 67.96 KIAS, where IAS and GS have been considered equal.
- j) A profile was drawn on the basis of the analysis. It was seen from the profile that from the turning point until it hit ground made a total of slightly less than 180° turn, about 172°. To complete 172° in 10s, as found during the test flights, needed an average bank of more than 45° bank.
- k) PFL is normally carried out with throttle in idle position. Since the Instructor pilot confirmed during his interview that he was flying the aircraft, he might have brought the throttle to idle when commencing the reciprocal turn, initially with shallower bank angle and progressively increasing, understandably, with the greatest bank angle towards the end of the turn.
- l) As per the profile drawn, a/c needed to travel 983 ft. in 10s, at an average speed of 58 kt. If the speed at the beginning of the turn was 70 kt. the lowest speed, presumably, at the end of the turn was 46 kt. GS and IAS have been considered equal.
- m) Common presumption that the aircraft hit the ground because the a/c might have stalled can be considered but difficult to prove. During a turn the stalling speed grossly increases in a level flight. If the aircraft had stalled, it should have stalled during the turn, hitting the inside wing i.e. the left wing with the most vicious impact on the initial ground contact. It did not. Moreover, in case of stall aircraft could not have made so many jumps having the last one most vicious. It would rather have made fewer jumps with the initial contact most vicious. However, a/c stalling at the last moment just before hitting the ground could not be ruled out.
- n) Evidenced from the ground markings and aircraft damage analysis, it can be said that the right wheel made the first contact followed by the tail skid and the bottom of the right wing when it hit the ground having its left wing apparently over the runway.
- o) The a/c covered a total distance of 983 ft. during its travel from the beginning of the turn until it hit the ground in the semi-circular flight path losing 155 ft. in 10s. The a/c completed 172° turn when it hit the ground. As mentioned earlier that it takes 15s to turn 180° with 45° bank. Mathematically, in 10s with 45° bank the a/c could have turned 120° only. It may therefore be said that taking this mathematical calculation into consideration linearly, it needed an average bank angle of 60° to complete the turn of 172° in 10s.
- p) It has been learnt from experienced pilots that in a similar situations pilots would normally begin with normal bank and then adjust as necessary. It can therefore be said that when started turning from DW position the Instructor pilot started with normal bank and adjusted during the process of turning. Since the average bank angle required was found out to be 60°, he must have used even more than that to be able to come where the a/c finally ended to have crashed. Because of frequent adjustment of bank the a/c appeared unstable during the turn which was confirmed by several eye witnesses.

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- q) Stalling speed of this Type and Model of a/c at the most favorable CG location, at 60° bank angle is 51 KIAS as per a/c POH figure 5-3. Average speed the a/c had flown during the turn was found to be 58 kt. lowest being as low as 46 kt. The question is why the a/c did not stall while flying below the stalling speed? Answer is that the speed illustrated above is applicable for level flights only. In this particular case the a/c flew most of the time during the turn above the stalling speed of 51 kt. An a/c would not normally stall until the angle of attack (AOA) to the relative airflow is close to the critical angle. This a/c was literally in a diving attitude during the turn.
- r) The IIC assumed that the a/c came to the lowest speed at the last part of the flight profile. During the interview the Instructor Pilot claimed, "I initially controlled it, but later on it went out of the RW and caught fire". What did he signify by 'initial and later' is a matter of analysis. The Investigation Team after elaborate study and research concluded that the 'initial' part was from the beginning of the turn until when it was crossing the western edge of the RW and the 'later' part was from the western edge of the RW till it hit the ground. That the a/c was under his control initially is true, except that he was not aware he was maneuvering the a/c in a dangerous flight profile.
- s) The Investigation Team presumed that when the a/c came over the western edge of the RW its height was 39 ft. distance 246 ft. left to travel in 2.5s and still 48° left to complete the reciprocal turn to have made a possible successful landing.
- t) The Investigation Team further ascertained that the Instructor Pilot tried to roll out swiftly and pitch up quickly resulting the a/c to stall from a very low altitude. When the a/c hit the ground three directional components were active on the a/c: vertical component due to last moment stall, lateral component to the right due to centrifugal force created by high angle steep turn to the left and forward component due its remaining air speed. It was evident from the picture of the wreckage that when a/c first hit the ground its right wing was down with pitch up attitude. Right wing down caused by swift roll out by the pilot accentuated by ground effect on the left wing causing the right wheel to touch first. The side load was so great that when it hit the ground the right wheel severed from the base of the spring leaf strut and rolled across the RW resting about 400 ft. away. Immediately after the wheel touched, the tail-skid to the right side hit the

ground followed by hitting at the bottom of the right wing. The reaction caused the a/c roll to the left having its left wing-tip dig through the ground for some distances creating some drag and then the nose hit the ground breaking the nose wheel apart creating further deceleration and then jumped and finally rested about 80 ft. away and about 30 ft. to the right due to residual forward and centrifugal force damaging the a/c severely. A/C also caught fire upon the final contact.

### 2.3 Cause Analysis:

- a) The Instructor Pilot did not brief the Trainee Pilot, yet took the Trainee Pilot up on that flight;
- b) The Instructor Pilot decided to continue the exercise unplanned;
- c) The Instructor Pilot decided not to execute a go around when obvious doubt existed regarding a successful landing;

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- d) Existing weather was not contributing factor for the accident;
- e) High ground temperature might have played a role on aircraft performance due to the presence of mild updraft;
- f) ATC transcript indicated that the flight details given by the Instructor Pilot were not very clear. The ATC did not ask him to repeat the flight details. If asked, it is presumed, the Instructor Pilot might have got an opportunity to re-organize his thought process which could have broken the chain of events, thus probably preventing the accident. If ATC had understood the Instructor Pilot correctly, he could have asked him the reason for early turn to the right after airborne. He did not, although such early turn is not recommended for any kind of training activities. Had he raised this question, the chain of events of accident could have been broken any way, and could have probably avoided the accident;
- g) There was no issue regarding maintenance of aircraft, mass and balance, instrumentation and/or aircraft systems that could contribute for the accident to occur;
- h) Human Factor and Error stood as major issue that contributed for the cause of the accident. The Instructor Pilot was trying to get an airline job which apparently did not materialize initially due financial factor. Later he could manage to join a cargo airline and completed his simulator training on ATR-72. But, the airline did not sustain itself due to some legal reasons. It was a frustrating time for the Instructor Pilot. When he was working for another flying school, he frequently complained about unfavorable working condition there. When he was about to be appointed as the CFI for the affected flying school, he finally got a job in a cargo airline. His mental condition under the changed circumstances, could be termed as not adequately stable.
- i) The Instructor Pilot was allowed to work for only five days according to the NOC from his new employer. The day of accident was his fourth day of working. He was due to leave the job on the next day and proceed for simulator training on SAAB-340 aircraft for a separate cargo airlines that he had joined off late.
- j) There were back logs of trainings in the flying school due to the recent winter weather and shortage of experienced instructors. Numbers of students were awaiting their checks and tests to be carried out. The Instructor Pilot, as the de-facto CFI, took it on his shoulder to complete as many checks and tests that he could finish before he left.
- k) The Instructor Pilot operated three flights from 0915 to 1335 hours local time on the day of accident, completing his day's task. Yet he wanted to continue and operate one more flight with the last student he flew with, because his performance needed to improve. But the SP did not want to continue as he was not feeling well.
- l) Although the ill-fated student pilot was scheduled to fly with the other flying instructor who earlier conducted the briefing on PFL, the Instructor Pilot who was involved in the accident decided to take up the ill-fated student pilot for the flight, probably to demonstrate PFL under different conditions.

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- m) The Instructor Pilot had already completed his share of day flights. He was scheduled to operate three night flights and supervise three night solo flights. The Flying School was operating with two a/c and three instructors on the day of accident. The Flying School instructors were also giving services to the students of another flying school at the same station under an agreement. Due to limiting wind condition for solo flight, two among the three flying instructors took up two students but without the ill-fated Trainee Pilot. At that stage of the day it was felt that all students were getting their share of flights except the ill-fated Trainee Pilot as per the schedule of the day. During the interviews of his students, it has been noted that the Instructor Pilot earned the respect because of his sincerity and hard work as an instructor. Since one aircraft was available the Instructor Pilot decided to take the ill-fated Trainee Pilot up for the flight so that the incumbent ill-fated Trainee Pilot would not feel left over. In this case, the mental pressure on the part of the Instructor Pilot to complete the tasks before his leaving the Station could be a contributing factor;
- n) That the Instructor Pilot might have experienced a **visual illusion** as he thought to be at a safe distance. If his height was higher, he could have realized his actual distance was not enough;
- o) Had the Trainee Pilot raised a question regarding the height or the distance, could have broken the chain of events, thus preventing the accident. But the Trainee Pilot was inadequately experienced to raise a question regarding the decision of a highly experienced and a knowledgeable flight instructor. Moreover, Trainee Pilot might have been too tensed already as to what was going on. Also that there was no such procedure in practice in the flying schools for the students to raise questions regarding their instructors nor such procedure is prescribed in the TPM or in the SOP. One or a combination of these might have prevented the Trainee Pilot to play a positive role to prevent the accident.
- p) Serious question remained as to why the Instructor Pilot did not discontinue the exercise or initiate a go-around when obvious doubt existed regarding the successful recovery the flight.
- q) Ego and/or overconfidence could be a contributory factor;
- r) Probable engine failure of problem was ruled out as was evidenced during Pilot interview;
- s) Stalling of the aircraft was also ruled out as was evidenced during Pilot interview;
- t) Intentional or un-intentional shutting down the engine was could be a factor as was evidenced in his ATC communication, wherein his final call to ATC was that he was coming on final for full stop, contrary to the flight details he had passed to the ATC before departure;
- u) During the wreckage investigation the mixture control was found to have been pulled out to idle cut off position. The burning marks on the mixture lever confirmed that the lever was exposed to fire. If this analysis is correct, then it can be said that the option of going around was not there at all;
- v) During the interview of few students, it was revealed that at least in two occasions the Instructor Pilot demonstrated PFL with engine shut down, both cases at 2000 ft. over the RW. Both

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students confirmed that Instructor Pilot's handlings were excellent and landed with exceptional accuracy.

- w) The Investigation Team concluded that Fire Vehicle arrived late than normal and took extra time to position itself to release the agents.
- x) Although the firefighting ended within about a minute, the Trainee Pilot succumbed to death spontaneously.
- y) The Instructor Pilot initially receive 71%, was taken to hospital immediately, later on was sent abroad for treatment but died after 43 days.

### 3. CONCLUSION

#### 3.1 Findings

- a) The a/c was certified, equipped and maintained in accordance with existing regulations and approved procedures.
- b) The a/c had a valid certificate of airworthiness and was airworthy when dispatched for the flight.
- c) The mass and balance was not a factor for the accident.
- d) There was no evidence of any defect or malfunction of the a/c.
- e) The a/c was structurally intact prior to the impact.
- f) All damages to the a/c were attributable to the severe impact forces and subsequent fire.
- g) The a/c was destroyed by impact forces and post-impact fire.
- h) The position of mixture control was found to be in the **idle cut-off** position.
- i) Engine and propeller damages were consistent that the engine and propeller had stopped prior to the impact.

#### 3.1.2 Crew/Pilot

- a) The Instructor Pilot and the Trainee Pilot were qualified and licensed.
- b) The Instructor Pilot and the Trainee Pilot were adequately rested as per the existing regulations.
- c) The Instructor Pilot and the Trainee Pilot were in compliance with the existing flight and duty time regulations.

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- d) The Instructor Pilot decided to do an **unauthorized exercise** to demonstrate PFL to his Trainee Pilot from a **very low altitude** and **close DW position**.
- e) The Instructor Pilot probably shut down the engine while turning from downwind, possibly to give a real life experience to the Trainee Pilot.
- f) Long working hours on the previous day and bare minimum rest afforded to the Instructor Pilot night before might have **transiently fatigued** him that led him to take those decisions and actions.

### **3.1.3 Operations**

- a) The exercise which led to the accident was not included in the syllabus of the approved TPM of the ATO.
- b) The Instructor Pilot continued the reciprocal turn to make a successful landing beyond the performance limit of the aircraft.
- c) There was insufficient height when the pilot started the reciprocal turn from the downwind position.
- d) When the Instructor Pilot swiftly tried to roll out from the steep turn and quickly rotated the a/c to avoid ground contact while crossing the other side of the RW might have resulted in a low altitude **stall** and hit the ground.

### **3.1.4 Operator**

- a) The ATO did not have an effective quality assurance program in place nor did it practice one.
- b) There was an absence of an effective control of operations and flight training.

### **3.1.5 Air Traffic Services and Airport Facilities**

- a) The ATC controller was rated but inadequately trained.
- b) The duty time and rest period of the ATC controller was within the limit. His work load on the day of accident was moderate.
- c) Controller failed to intercept or recognize an unauthorized and unusual early turn to the right immediately after take-off.
- d) The Instructor Pilot also failed to recognize the danger of turning for landing from so close a downwind position and from such a low height.
- e) The Instructor Pilot also failed to recognize danger of turning with such high bank at such low altitude.

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- f) The Instructor Pilot's final RT call to pass on the latest wind for a change of only 10<sup>0</sup> in direction at the very end only contributed in the distraction of the Instructor Pilot at the most critical phase of flight.

### 3.1.6 Medical

- a) It was sufficiently established that there was no evidence of physiological factors or incapacitation affected the performance of the crew.
- b) The Instructor Pilot could have suffered from transient **fatigue** due to insufficient rest and prolonged duty hours the previous day, although within the approved limitations.
- c) The Instructor Pilot might have had mental **pressure** to complete the tasks before he planned to leave the following day or so for simulator on other aircraft.

## 3.2 CAUSES

### 3.2.1 Primary Causes

- a) The accident had occurred due to an unauthorized exercise undertaken to demonstrate PFL from a very low altitude and close downwind position.
- b) A go-around or discontinuation was not possible due to a probable unauthorized engine shut down on the downwind position.

### 3.2.2 Primary Contributory Causes

- a) Transient fatigue of the Instructor Pilot due to insufficient rest and long working hours on the previous duty.
- b) Insufficient control of the operator in regard to operations and flight training.

## 4. SAFETY RECOMMENDATIONS

- a) All ATOs of Bangladesh may revise procedures to prevent any and all unauthorized activities on operations and flight trainings.
- b) All ATOs would like to revise their training syllabus and procedures as applicable to prevent any unsafe flying condition.
- c) All ATOs are to establish duty time, flight time and rest period applicable for the instructors and the students commensurate with safety.
- d) ATC controllers may receive updated training including periodical refresher training.

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- e) Procedures may be developed and implemented for periodical inspection of the fire fighting vehicles and equipment for their operations at all smaller stations.
- f) Procedures may be developed and implemented for effective man-power management at the smaller aerodromes.
- g) Aerodrome Fire Operators may receive updated refresher trainings.

This is to certify that this report has been compiled as per the provisions of ICAO Annex 13 for all concerned.

The report has been authenticated and is hereby 'Approved' by the undersigned with a view to ensuring prevention of aircraft accident and that the purpose of this activity is not to apportion blame or liability.



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