

SYNOPSIS OF INQUIRY REPORT ON INCIDENT
OF FORCED LANDING OF RAWALPINDI FLYING CLUB
CESSNA 150 AIRCRAFT AP-AXS NEAR FATEH JUNG
ON 9-5-1990

Cessna 150M aircraft Registration No. AP-AXS while on a training mission experienced partial loss of power. AFI took over the controls and decided to make an emergency landing at Fateh Jang airstrip. However due to the reported complete loss of power he had to make an immediate forced landing and could not make the airfield ahead (FATEH JANG). The forced landing was made in an agricultural field. During landing roll nose wheel struck against the raised hard edge of the boundary of the field. This caused the aircraft to nose over. The nose wheel strut sheared off from close to the fuselage. The wreckage was found in inverted position in the adjoining field. Aircraft engine mounts gave way completely. Engine cowling, wings and empennage also got damaged. Dismantling of the engine revealed No. 4 Cylinder exhaust valve seizure in its guide & valve was found in stuck open position. This resulted in partial loss of power. The only plausible cause of complete loss of power was switching off of fuel valve by the pilot during emergency landing drill and consequent loss of fuel to engine. The pilot carried out the trouble checks but to no avail, in fact, as contended by him, the R.P.M. dropped down further and the aircraft had to be put down in an open field.

291

INCIDENT INVESTIGATION REPORT OF CESSNA-150
AIRCRAFT AP-AXS

Authority: Director General Civil Aviation Authority
Memorandum No. HQ CAA/1901/113/AIB, dated
10.05.1990. Attached as **appendix 'A'**.

1. AIRCRAFT INFORMATION:

- | | | | |
|----------|---|---|---|
| 1.1 | Nationality and Registration Marks. | : | AP-AXS |
| 1.2 | A/C type and maker's Serial No. | : | Cessna - 150M
S.No. 76475 |
| 1.3 | Engine type(s), Airframe position(s) and maker's Sr. Nos. | : | Continential 0-200-A
installed in Nose.
S.No. 25R 743. |
| 1.4 | Certificate of registration No. and date. | : | Certificate No. 466
dated 10.06.1985 |
| 1.5 | Certificate of A/W No. and date of expiry | : | Certificate No. 419
dated 10.06.1985
valid till 28.11.90. |
| 1.6 | Year of construction of Airframe. | : | 1974 |
| 1.7 | Name and address of owner: | : | Civil Aviation Authority (on loan to Rawalpindi Flying Club) Director General Civil Aviation Authority, 19-Liaquat Barracks, Karachi-4. |
| 1.8 | Gross weights. Maximum permitted by 'C of A' for this flight & at the time of accident. | : | 1600 lbs (727 Kgs) |
| 1.9 | Loading. Centre of gravity: limits in 'C of A' and centre of gravity position at the time of accident and commencement of flight. | : | C.G position corresponding to empty weight is 28.5 aft of datum point. |
| 1.10 | Airframe history | | |
| 1.10.1 | Total time since : | | |
| 1.10.1.1 | Repair in 1986 | : | 2836:30 flying hours. |
| 1.10.1.2 | Last 'C of A' | : | 599 :50 flying hours. |
| 1.10.1.3 | Last check of approved Maintenance Schedule. | : | 4 :30 flying hours. |
| 1.10.2 | Mandatory modifications : | | All mandatory modifications had been complied with. |
| 1.11 | Engine history | | |
| 1.11.1 | Total time since | | |
| 1.11.1.1 | Manufacture | : | 1314:45 flying hours |
| 1.11.1.2 | Last Overhaul | : | 1314:45 flying hours. |
| 1.11.1.3 | Last check of approved Maintenance Schedule. | : | 4:30 flying hours. |
| 1.11.2 | Mandatory modifications. | : | All mandatory modifications had been complied with. |

1.12 Accessory(Propeller) history.

1.12.1 Total time since

1.12.1.1 Manufacture : 2836:30 hrs.

1.12.1.2 Last overhaul : N/A

1.12.1.3 Last check of : 4:3 hrs.
approved Maintenance Schedule.

1.12.2 Mandatory Modifications: All mandatory modifications had been complied with.

1.13 DEFECTS

1.13.1 Scrutiny of pertinent documents of aircraft revealed that aircraft AP-AXS made forced landing near Sang Jani Railway Station on 27.11.76 because of loss of power. Due to uneven space nose wheel struck the obstruction and aircraft tipped over. The aircraft was de-registered. Nature and extent of damage to aircraft necessitated major repairs. Repair of aircraft was carried out in 503 workshop Army Aviation Base, Dhamial by cannibalising parts from an aircraft fuselage purchased from Peshawar Flying Club. Aircraft was re-registered in 1985. 'C of R' & 'C of A' in respect of this aircraft were issued in 1985. 'C of A' was validated and subsequently renewed by field office of Islamabad. Test flight for validation of 'C of A' after repair was carried out by Mr. Raja Abdul Rauf as pilot on 30.08.86. In test flight report submitted on form CAA-058 engine r.p.m. at take off were shown to be 2550 r.p.m and its cruise performance was tested at engine r.p.m. of 2200 (Photostat copy attached as appendix 'C'). Subsequently test flights indicate appropriately same parameters. Whereas after repair the aircraft could never maintain height below engine r.p.m. of 1400, particularly when OAT was above 36°C. Engine data plate and aircraft operation manual indicate that maximum engine r.p.m both at take off and cruise is 2750. But record does not indicate that this was ever achieved. However, test flight carried out on 13.12.75 prior to forced landing on 27.11.76 indicates that maximum take off engine r.p.m was 2700 (Photostat copy attached as appendix 'D').

A new engine Cont.0-200A Sr.No.25R743 was installed at the time of re-registration of aircraft in June 1985. This engine was removed after 715:55 flying hrs. on 20.09.1987 and reinstalled on 22.10.89. Record does not indicate whether it was inhibited and stored in accordance with Airworthiness requirements. No entry pertaining to the same is available in the relevant Log Book. During the period 20.09.87 to 22.10.89 another engine Cont.0-200A Sr.No.25R099 was installed which was removed after consuming 1521 hrs. because of excessive oil leaks.

1.13.2 Defect of engine r.p.m. fluctuation was reported on 07.05.90. As a rectification induction and exhaust system were checked for leaks. Induction clamp was tightened and carburator flushed. Induction filter was serviced and engine controls were checked. Ground run up was found satisfactory.

2. CREW INFORMATION:

2.1 Pilot-in-Command

2.1.1.	Name	Mr. Muhammad Rashid Akram Khan
2.1.2	Position in the Cockpit	Asstt. Flight Instructor
2.1.3	Type of Licence held & No.	CPL No.1085
2.1.4	Ratings	
2.1.5	Flying Experience.	

2.2 Co-Pilot

2.1.1	Name	Mr. Azhar Iqbal
2.2.2.	Position in the Cockpit	Student pilot
2.2.3	Type of Licence held & No.	SPL Since 13.6.89
2.2.4	Ratings	Nil
2.2.5	Flying experience	70 flying hours

29f

3. SUMMARY OF INCIDENT:

On 09.05.90 Cessna 150M aircraft AP-AXS was on navigation mission as part of training of student pilot Mr. Azhar Iqbal from Chaklala to Jabar and back. At 1344 hrs. PST and 16NM out of Chaklala and at height of 3700 ft aircraft met with an emergency. Aircraft engine had a partial loss of power and its speed dropped from 2400 to 2200 r.p.m which was considered insufficient to sustain straight and level flight by AFI Mr. Rashid Akram Khan. He tookover the controls and decided to make an emergency landing at Fateh Jang. However, after about two minutes he reportedly experienced complete loss of power. He attempted to restart the engine but reportedly his attempt failed. He, therefore, decided to land at the nearest suitable field. Before landing he carried out the necessary forced landing drill and made a forced landing near village Choi 5NM short of Fateh Jang in a ploughed field. The aircraft reportedly landed in normal configuration and during landing roll the aircraft nose wheel struck against raised hard ground on the boundry of the field and as a sequel to that the aircraft nosed over and sustained major damage.

4. INJURY TO PERSON(S):

NIL

5. DAMAGE TO AIRCRAFT:

- 5.1 Nose wheel sheared off completely alongwith its attachment structure from fuselage and was found hanging from fuselage with left hand steering tube.
- 5.2 Port wing buckled at rear spar, near the attachment points.
- 5.3 Aircraft engine mounts were damaged completely.
- 5.4 Lower section of engine cowling was damaged completely.
- 5.5 R/H exhaust manifold was damaged. No.1 cylinder exhaust pipe was broken and battery acid was found spilled in it.
- 5.6 Trip of fin and rudder was damaged.
- 5.7 Dent of about 4" x 4" was found at the bottom rear side of fuselage.

28-6

6. OTHER DAMAGES:
Nil.
7. METEROLOGICAL CONDITION:
Weather report attached as appendix 'E'. Weather is not a factor in this incident.
8. NAVIGATION & LANDING AIDS (VISUAL/NON VISUAL):
N/A
9. COMMUNICATION(INCLUDING RADIO COMMUNICATION):
ATC Tape transcripts attached as appendix 'F'.
10. AERODROME AND GROUND FACILITIES:
N/A
11. FLIGHT RECORDERS:
N/A
12. WRECKAGE & IMPACT INFORMATION:
 - 12.1 On inspection of site it was observed that the field was of irregular shape and freshly ploughed. Aircraft landed in the direction of maximum dimension of field at an angle of about 45 degrees to burrow. However, aircraft touched down after about middle of the length of the field. Tyre marks revealed that the aircraft after initial touch down bounded off and second time touched down at a point about 150 feet short of the raised **boundary edge** of the field. During landing roll nose wheel struck against the raised hard surface (about 2 ft. wide and 1 ft high) causing the aircraft to topple over and jump a distance of about 60 ft. The wreckage was found lying in the inverted position in an adjoining field. Site plan is attached as appendix 'G'. The aircraft wreckage was found in one piece except that the Nose Landing Gear had sheared off and was hanging from the fuselage with L/H steering tube and two small pieces of engine cowling were found lying next to the inverted aircraft. Propeller was found in horizontal position and there was no damage either on propeller **blades** or propeller spinner. Main landing gears were intact.
 - 12.2 During wreckage examination the following were the position of different controls/indications.

24-11

12.2.1	Throttle	:	Closed.
12.2.2	Mixture	:	Full lean.
12.2.3	Cabin Air	:	Open
12.2.4	Altimeter	:	1700 ft.
12.2.5	ASI	:	Zero
12.2.6	D.I.	:	090 Degree.
12.2.7	V.S.I.	:	Zero
12.2.8	R.P.M.	:	Zero
12.2.9	Suction	:	Zero
12.2.10	Master	:	Off
12.2.11	Flaps	:	40"
12.2.12	Ignition	:	Off
12.2.13	Fuel shut off valve.	:	Off (vertical)
12.2.14	Primer	:	IN.

12.3 Wings, empennage & engine were dismantled from fuselage and transported to R.F.C. by truck for further investigation.

13. FIRE:
NO.

14. SURVIVAL ASPECTS:

It was a survivable incident. There are two exits on this type of aircraft and both were available for use. Evacuation was accomplished in time.

15. TEST & RESEARCH:

15.1 Magneto's alongwith H.T. leads were tested in 503 workshop of Army Aviation Base, Dhamial and were found serviceable.

15.2 Fuel sample from the aircraft was preserved and sent to HQ Airworthiness Branch Karachi for analysis against specification of 100LL fuel as no such facilities are available in this region.

15.3 Aircraft engine was dismantled in RFC and examined.

16. OBSERVATIONS:

- 16.1 As per statement of Raja Abdul Rauf (Witness No.4) aircraft could not maintain its height below engine r.p.m. of 2400. Aircraft records were examined but this defect could not be traced any where. However, in all the test flight reports since 1986 aircraft cruise performance was tested at engine r.p.m. of 2200 and was reported satisfactory.
- 16.2 Aircraft was operated at OAT of 37.2°C. However C.F.I. R.F.C. mentioned in his statement that he did never allow flying on AP-AXS above 36°C OAT.
- 16.3 Engine is rated to produce 100 BHP at 2750 rpm. There is no evidence that engine ever provided this power either at take off or during cruise. However, records indicate that engine static r.p.m. was within limits.
- 16.4 Aircraft propeller had no sign of damage. This indicates that at the time of touch down aircraft engine was not running and propeller was not rotating at all. However, on site the propeller was rotated by hand and it moved freely thereby indicating that engine had not seized. Plugs were removed and oil was found in all the four cylinders of the engine because of inverted position of the aircraft.
- 16.5 Agricultural field selected by pilot for forced landing was considerably long but aircraft touched down after about middle of the same at an angle of about 45 degrees to the plough lines/burrow thus leaving more than half of the field behind.
- 16.6 Aircraft was physically weighed at 503 workshop Army Aviation Base, Dhamial of 16.03.83, and its weight & Balance Schedule was approved on 01.09.86. As per existing Airworthiness requirements, physical weighing of aircraft is due after every 4 years. Apparently this requirement has not been complied with.
- 16.7 Check I of approved maintenance schedule was carried out on 09.05.90 but entry regarding the same was not made in the relevant engine log book.

24K

- 16.8 The flying hrs. on its re-commissioning in 1986 were taken as 00.0 hrs, **contrary** to standard practice.
- 16.9 On Cessna 150 aircraft fitted with Cont.0-200A engine at about engine r.p.m. of 2200 it takes about 10 seconds to cut the engine **when** fuel shut off valve is selected to closed position.
- 16.10 Records pertaining to Cessna 150M aircraft AP-AXS owned by Civil Aviation Authority were requested from HQ Airworthiness Branch and the concerned field office. HQ Airworthiness Branch did not have records prior to 1986 (Photostat copies of AFTN Messages are attached as appendix H1 & H2) Availability of this record might have made the investigation easier and could have revealed some additional points.

17. INVESTIGATION:

In order to determine the reported partial loss of power, aircraft engine was dismantled in RFC. Magnetoes, suction pump, starter-cum-alternator were **removed** from the engine and their couplings were examined and found intact. All the push rods were removed, examined and found satisfactory. A bent push rod can cause vibration & **partial** loss of power. When Rocker arms were removed, exhaust valve of No.4 cylinder did not come to close position (the inlet and exhaust valves are spring loaded to close position) thereby indicating that No.4 cylinder was not operating normally. This apparently cause partial loss of power. All the four cylinders were removed for detailed internal examination. No abnormality was noticed except scoring on exhaust valve guide of No.4 cylinder. The exhaust valve was moved in the guide manually but did not move freely. Carbon deposit was found on inner side of cylinder heads of all the four cylinders. This indicates abnormal oil consumption. Engine crank case was dismantled to examine crank shaft, cam shaft, bearings, connecting rods, tappets, oil pump etc. No abnormality was noticed. Carburetor was dismantled and examined. No abnormality was noticed. Magnetoes alongwith high tension leads were checked for proper functioning in 503 workshop Army Aviation Base, Dhamial in the presence of technical investigator and were found serviceable. Fuel sample of about 2 litres was taken from the fuel tanks of aircraft from the site of incident and sent to HQ Airworthiness, Karachi for

99-L

testing against specification of fuel 100LL as no facilities are available in this region.

18. WITNESSES:

18.1 Witness No.1

Mr. Muhammad Rashid Akram Khan CPL 1085, Assistant Flight Instructor, Rawalpindi Flying Club statement attached as appendix 'J'.

18.2 Witness No.2

Mr. Azhar Iqbal, student pilot Rawalpindi Flying Club, statement attached as appendix 'K'.

18.3 Witness No.3

Mr. S.M. Shah, AME-790, Chief Engineer, Rawalpindi Flying Club Statement attached as appendix 'L'.

18.4 Witness No.4

Capt. Raja Abdul Rauf, Chief Flight Instructor, Rawalpindi Flying Club statement attached as appendix 'M'.

19. DISCUSSION OF EVIDENCE:

Aircraft AP-AXS was registered in April, 1975. Test flight carried out on 13.12.75 for renewal of 'C of A' indicates that maximum take off engine r.p.m. was 2700 which is normal. Aircraft forced landed on 27.11.76 because of loss of power. During the forced landing aircraft sustained major damage and it was repaired in 503 workshop Army Aviation Base, Dhamial and a new engine Sr. No. 25R743 was installed on the aircraft. As mentioned by CFI in his statement after the repair the aircraft developed an inherent aerodynamic abnormality by virtue of which at engine r.p.m. of 2200 and below it could not hold height. It required at least 2400 engine r.p.m. to produce about 75 to 80 MPH indicated Air speed, particularly when OAT was above 36°C. This statement does not corroborate with the cruise performance data of aircraft provided by him in the first test flight for issue of 'C of A' in August 1986 after repair. This mislead the Airworthiness Branch and resulted in validation of 'C of A' in 1986. During the present incident of partial loss of power when engine r.p.m. dropped from 2400 to 2200 the aircraft should have been able to sustain heights. Since the aircraft could not do so it indicates that probably the repair carried out was improper thereby

94-M

resulting in an inferior performance of aircraft. It can, therefore, be said that recent statement of CFI as opposed to the test flight proforma is more accurate and indicative of factual position. Moreover, this also corroborates with the statement of AFI Mr. Rashid Akram Khan. Repair after the previous forced landing was a major structural repair. Since the repair was not available in manufacturer publications the operator should have prepared repair scheme and obtain approval from Airworthiness Branch, as per airworthiness requirements. Record does not reveal any such approval from airworthiness branch. The repair ~~necessitated~~ the use of jigs and fixtures for ensuring accurate alignment of fuselage and wing. 503 Workshop Army Aviation Base, Dhamial did not possess the required jigs & fixtures at the time of repair. The engine Sr.No.75R743 was installed and then removed after consuming 715:55 flying hrs. on 20.09.87. Relevant log book neither indicates the reason for the removal of the same nor whether it was inhibited and stored in accordance with airworthiness requirements. Another engine Sr.No.25R099 which was installed on aircraft during the period 20.09.87 to 22.10.89 was also removed after consuming 1521 flying hrs. i.e. 549 hrs. prior to normal operating life of 2160 hrs.(including 20% extension in life) because of excessive oil leaks. Engine Sr. No.25R743 was re-installed on 22-10-89 and had done about 600 hrs. till 09.05.90 and a total of 1314 hrs. since new. As mentioned earlier aircraft was not capable of maintaining its height below engine r.p.m. of 2400 therefore engines installed on the same were always operated at relatively higher rpm settings ie. 2400 and above. Moreover, certified/rated fpm of Cont.0-200A engine at take off and at max. Continuous cruise is 2750 for producing 100 BHP but did not indicate that this rpm/power was ever achieved on both the engines installed on the aircraft after its re-registration. The record indicates that the max. engine rpm. achieved at take off were 2550. Relevant log book entries as well as the test flight reports from 1986 onwards for both the engines indicate that static rpm were within limits. Engine static rpm is the parameter for checking conditions of engine on ground. This, therefore, proves that both engines ~~when~~ installed (i.e. when they were new) were healthy and giving required performance. However, airframe engine combination was giving lower than standard performance as is evident from test flight forms. This was happening due to defective repairs of airframe. Since engines were being continuously



operated at higher setting to enable reasonable/sustainable performance, the engines were being un- necessarily over stressed. This in due course of time resulted in early deterioration of engines, thereby causing premature failure at 1314 and 1521 flying hrs, instead of normal operating life of 2160 flying hrs. (including 20% extension in life) It will be worth mentioning here that almost all Cont.0-200A series engines have been providing normal operating life of 2160 flying hrs. without any failure. Moreover, Cessna 150 aircraft AP-AXS was being used for training purposes (i.e. rapid opening and closing of throttle for various training manouveres which causes abrupt temperature changes and stress), thereby further aggravating the **situation** This resulted in over heating of both the engines. In case of engine Sr. No.25R099 excessive oil leakage was noticed at 1521 flying hrs. As it was detected in time the engine was changed thereby averting any mishap. In case of engine serial No.25R743 exhaust valve of No.4 cylinder seized in its guide at 1314 flying hrs. The valve remained in stuck open position thereby causing reported partial loss of power and subsequent forced landing. Due to partial loss of power the engine rpm dropped from 2400 to 2200 which was insufficient to sustain straight and level flight. **API** took over the controls and decided to make an emergency landing at Fateh Jang. However, after about two minutes he reportedly experienced complete loss of power. He attempted to restart the engine but his attempt failed. This is not substantiated with the evidence available at our disposal as all the required things were found to be normal (i.e. propeller could be freely rotated by hand, sufficient fuel and oil were available. Magneto and H.T. leads were serviceable, carburator, starter etc. were serviceable). The only plausible explanation is that during emergency drill, prior to making forced landing mixture control was ^{set} to ~~idle~~ cut off and fuel shut off valve was pulled thereby cutting fuel supply to engine. On Cessna 150 aircraft fitted with Cont.0-200A engines it takes about 10 seconds to cut the engine when fuel shut off valve is operated at about 2200 rpm. ATC. transcript also does not indicate any conversation regarding complete loss of power. The pilot had to make forced landing at Choi instead of Fateh Jang because of complete loss of power .

The elevation of the general area is about 1600-1700 ft(AMSL). Thus the height about ground level at the time when the pilot completed his throttle checks etc. was hardly 1000-1200 ft

as such his decision to put the aircraft in the agricultural field seems justified.

20. CAUSE(S):

Failure of No.4 cylinder exhaust valve and the inharent abnormality in the fuselage of the aircraft.

FINDINGS

The Board finds that:-

- (1) At the time of take off the engine was fully serviceable.
- (2) Exhaust valve of No.4 cylinder was found in stuck open position in its guide, thereby causing partial loss of power.
- (3) During emergency drill mixture control was set to idle cut off and fuel shut off valve was selected to close position thereby cutting off fuel supply to engine which caused complete loss of power during the forced landing.
- (4) The pilot ~~failed~~ to make landing approach in a manner which would have allowed the full use of the selected field and minimise the damage to the aircraft.
- (5) Structural repair carried out after previous forced landing of aircraft on 27-11-76 was improper thereby resulting in inferior aerodynamic performance of aircraft.
- (6) Test flight reports after aircraft structural repairs do not indicate the factual performance of the engine and aircraft AP-AXS.

RECOMMENDATION(S)

The Board recommend that:-

1. The operator may be warned for having violated:-
 - 1.1 Airworthiness requirement regarding approval of structural repair scheme not covered in manufacturer publications which was not complied with.
 - 1.2 For having carried out major structural repair involving accurate alignment without the use of jigs and fixtures. Thus leaving a room for creating abnormality in the aircraft structure/performance.
 - 1.3 For having recorded incorrect data during test flights, which formed the basis of issue/renewal of 'C of A'.
 - 1.4 Airworthiness requirement of physical weighing of aircraft after every 4 years.
 - 1.5 For not logging aircraft hrs. properly.
2. The aircraft must be operated within the recommended parameters.
3. Test flight proforma should be developed for each type of aircraft separately and should provide all the necessary limits regarding performance of aircraft and engines.
4. Qualification and experience requirements for pilots carrying out 'C of A' test flights be laid down.



(RASHID A. CHAUDHRY)
Group Captain (Retd),
General Manager,
General Aviation,
Investigator Incharge.

Date:- _____



(Engr. SHAMSHAD AHMED QURESHI)
Airworthiness Surveyor,
CAA, Lahore Airport.
Investigator.

Date:- _____







