سول ایوی ایشن اتھارٹی

CIVIL AVIATION AUTHORITY

INVESTIGATION REPORT

ON

FIRE INCIDENT TO RAJI AVIATION (PVT) LTD.

AIRCRAFT CESSNA-337 AP-BBX

WHICH OCCURRED ON 27-9-1992

AT

QUAID-E-AZAM INT'L AIRPORT

CIVIL AVIATION AUTHORITY

INVESTIGATION REPORT ON THE FIRE INCIDENT INVOLVING RAJI AVIATION (PVT) LTD AIRCRAFT CESSNA-337 AP-BBX AT GENERAL AVIATION AREA QUAID-E-INT'L AIRPORT KARACHI

Authority: Director General of Civil Aviation Authority Memordandum No. HQCAA/1901/148/SIB dated 6th October 1992. (Appendix "A").

COMPOSIATION OF TEAM

(a) Mr. Mohammad Ali Siddiqui : Investigator-in-Charge
Ops. Investigator, CAA

(b) Engr. Munawar J. Qureshi : Investigator
Sr. Airworthiness Surveyor

(c) Mr. Pervez Akhtar Ansari : Investigator
C.F.R.O., CAA

1. AIRCRAFT INFORMATION

1.1. Registration Marking	:	AP-BBX
1.2. Aircraft type and maker's S. No.	:	CESSNA-337/H SKYMASTER AIRCRAFT: 01869
1.3. Engine types, airframe position & maker's S.NO.	:	CONTINENTAL 10-360G FRONT ENGINE=352768 REAR ENGINE=352769 (ON 24.9.88 REAR ENGINE CHANGED TO SR.NO. 50R464 at its 1497.12.HRS).

1.4. Certificate or registration No. and validity.	:	573 DATED 25.4.91 VALID AT TIME OF FIRE INCIDENT
1.5. Certificate of Airworthiness No. & date of expiry	:	526 (REV-I) DATED 5.5.85 VALID UPTO 5.7.89 **NOTE:** C of A was not valid at the time of incident & its no intimation was submitted.
1.6. Certificate of Maint date and time (GMT) of issue & period of validity.	:	Not applicable in this case as the aircraft was not Airworthy at the time of incident.
1.7. Date of construction of airframe	:	1978
1.8. Name & Address of Owner	:	M/s.Raji Aviation (Pvt)Ltd., Hamilton Hanger, QIAP, Karachi (PAKISTAN)
1.9. Gross Weight Maximum permitted: by C of A. at the time of incident.		4630 Lbs.
1.10. Loading Centre of gravity Limit: in certificate of Airworthiness and centre of gravity position at the time of incident.		139.30 Inches aft. of datum point which is 65 inches ahead of front face of front engine fire wall

1.11.Airframe history : At last C.of A. hrs since new 1361.10 hrs. Essential modifications:-

i. SNL 85-17 dt 29.3.85 Induction Air Filter Replacement.

ii. S.B.M82-22 dt 1.6.82 - fuel & oil grades.

iii. M80-22 dt 1.10.80- Revised overhaul periods of continental engine.

iv. M82-12 dt 9.8.85 - Replacement of parts.

v. M85-8 dt 3.7.85 - Piston identification & its ring application.

vi. M85-17 dt 1.10.85 - Piston ring table of compression limits.

vii. M87-8 dt 31.8.87 - Aircraft Engine Plate.

viii.SNL 85-3 - A/c windshield & window maint procedure. A/c was grounded for the last four years approximately due to many reasons and want of C. of A inspection for which no such intimation was pro-

vided either at Controller of Airworthiness (South) Office KAP or Chief of Airworthiness HQ CAA.

1.12. **ENGINE HISTORY** :

1.12.1. Front Engine hrs Since New	1361.10
1.12.2. Propellor type installed	MECUALY MC1D 2AF34C310 (S.N.798928)
1.12.3. Propellor hours since overhaul	50.05
1.12.4. Rear Engine hrs since new	1485.47
1.12.5. Propellor type installed	MECAULY MC1D2AF34C307 (S.N.782153)
1.12.6. Propellor hrs since overhaul	50.05

1.13. ACCESSORY HISTORY

1.13.1. FRONT ENGINE

No.	ACCESSORY	SERIAL NUMBER	TOTAL HOURS FLOWN SINCE NEW
i.	Magneto (R.H.S)	A189657	1361.10 hrs
ii.	Magneto (L.H.S.)	A184844	1361.10 hrs
iii.	Starter	3LC00482	1361.10 hrs
iv.	C.S.U.	786113	1361.10 hrs
v.	Fuel Injector pump	E0378013	1361.10 hrs
vi.	Vacuum pump	2E3269	1361.10 hrs

1.13.2. REAR ENGINE

NO.	ACCESSORY	SERIAL NUMBER	TOTAL HOURS FLOWN SINCE NEW
i.	Magneto (R.H.S.)	A176248	1485.47 hrs
ii.	Magneto (L.H.S.)	A97642	1485.47 hrs
iii.	Starter	7J-000-6911	1485.47 hrs
iv.	C.S.U.	750482	1485.47 hrs
v.	Fuel Injector pump	2107409B	1485.47 hrs
vi.	Vacuum pump	6K-4554	1485.47 hrs

1.13.3. **B.P.C. OF INSTRUMENTS**

NO.	INSTRUMENT	SERIAL NO.	REMARKS
i.	Air Speed indicator	13182	
ii.	Altimeter	M5091	
iii.	Altimeter	M5098	
iv.	Vertical speed indicator	F7655	BPC carried out at PAF on 23.3.1988 to 28.3.1988
v.	Manifold pressure gauge	56662	
vi.	Fuel Flow Indicator	91166	

1.14 **DEFECTS**

1.14.1. The last defect reported was an VHF system due to which aircraft AP-BBX landed at NAWABSHAH on 3.3.1989 whithout any schedule. Defect was attended by AME-712. The investigation at that time revealed fault on the part of pilot (Mr. Imtiaz-ul-Haq) who did not indicate his destination in aircraft documents and defect was no attended at Nawabshah and aircraft was flown back to Karachi without intimation to airworthiness field office.

1.14.2. As regard to technical defect in airframe, engine or accessories nothing has been found during investigation. Reason being aircraft was not airworthy and not even under renewal of Certificate of Airworthiness work or related inspections and apparently no technical work on aircraft was in progress at the time of fire incident. The claim of operator that the aircraft has being painted is also baseless as no such evidence could have been

produced in this regard. However, presence of "FUNNEL" near the scene noted at the incident, which is evident due to eye witnesses statements supplimented by photograpahs, indicates the refuelling/Defuelling from aircraft was in progress before the fire incident occurrence.

2. CREW INFORMATION

2.1. Not applicable in this case as aircraft was not airworthy or no flying was planned whatsoever it may be prior to the fire incident.

3 SUMMARY OF INCIDENT

3.1. As claimed by M/S. Raji Aviation, the aircraft was being cleaned (AP-BBX) when all of sudden fire broke out at 0340 P.M. on Sunday 27th September 1992, within the boundry of Raji Aviation loacated at Karachi Airport. The height of flames noticed at the site of incident was around 25 feet with black smoke.

4. INJURY TO PERSONS

4.1. No injury was caused.

5. DAMAGE TO AIRCRAFT

5.1. Upon arrival of investigation team at the scene on the day of fire incident at about 0645 P.M. the wreckage of aircraft was being removed at the spot. The brief look of wreckage indicates that aircraft was totally burnt. Both the wings had fallen apart and were found burnt. The engine position was similar as seen. The remains of aircraft was its totally burnt fuselage section.

6. OTHER DAMAGES

6.1. No other damage could be ascertained on the scene except the aircraft itself. However, nearby twenty to twenty five feet high trees were found burnt due to high flames of fire.

7. METEROLOGICAL CONDITIONS

7.1. The weather on the day of fire incident was perfect and normal. Although light breeze was blowing but humidity was quite high about 45% at the time of incident. The temperature recorded was 32 C. Other meterological facts are irrelevent as the aircraft was not in flight phase when the incident occurred.

8. NAVIGATION & LANDING AIDS(VISUAL/NON VISUAL)

8.1. Not a factor in this case.

9. COMMUNICATION

9.1. Not applicable in this case.

10. AERODROME & GROUND FACILITIES

10.1. In the fire incident, fire & rescue services CAA of Karachi Airport were utilized who brought fire under control and extinguished the same efficiently and smartly. Firemen watched the scene even after completely extinguishing the fire and left the scene at late hours upon their satisfaction and removal of aircraft wreckage from the site. It would be worth while to mention here that fire section completed their operation within five minutes of the receipt of fire information from Control Tower.

11. **FLIGHT RECORDER**

11.1. Not applicable in this case.

12. **WRECKAGE & IMPACT INFORMATION**

12.1. The wreckage of burnt aircraft AP-BBX was found inside the parking place of aircraft in M/S. Raji Aviation at Karachi Airport who are owner of aircraft. The exact location is in the centre and forward of the main building around which number of other aircraft were found parked. Fire marks, soot marks and traces of ash were found near thewreckage of aircraft. Both the wings and propellers were found apart and burnt alongwith fuse lage. The fire was so strong, and intense that the metal of aircraft at some places melted and solidified. The interior of fuselage was also found destroyed. At the scene broken and burnt portion of left wing revealed presence of flowing fuel mixed with water. The water had come from crash tender which was putup on burnt object to bring their temperature down. The fuel was recognised at the spot by smelling.

13. **FIRE**

13.1. M/S. Raji Aviation had been involved in wrong practise of fuelling and defuelling aircraft without taking the required precaution. This is evident at (App."B4 - B11"). Although the aircraft was unairworthy, the aircraft was being refueled regularly. Fuel as much as 500 litres was being filled in this aircraft after a gap of 6 or 7 days indicates that this fuel was later on being transferred to other aircraft by means of small plastic buckets. This is a wrong practice as it may cause fuel contamination and cause flame out of the

aircraft. On one of the inspections of Raji Aviation Company this point was mentioned by the officer in his inspection report (Appendix O&P). The company were told to stop this practise immediately. The presence of the funnel in the photograph at (App-"B11") regular refuelling receipts (App."C1 - C2") is a clear indication that this aircraft was being used to store fuel and later on fuel was transferred to other aircraft as and when required. During one of the defuelling and transfer operations the aircraft caught fire. A spark from a cigarette could have resulted in fire.

13.2. **PROBABLE CAUSES OF FIRE** The actual cause of the fire has been undetermined. However the following possibilities could have been a factor in the starting of the fire.

13.2.1. Battery of aircraft can be considered as the cause of fire. It would be worth to note that all aircraft batteries outgas Hydrogen under certain circumstances. If the battery is improperly vented hydrogen can accumulate in the battery compartment and be ignited usually by an electrical spark. Resulting fire is likely to be a low order detonation and will probably consume all Hydrogen. There will be no by product in the form of soot or smoke as there was on carbon present in the reation.

13.3. After discussing possibilities of fire causes, study on sources of ignition was undertaken as detailed below:-

13.3.1. **ENGINE HOT SECTION** Not applicable in this case as engine was not hot.

13.3.2. **ENGINE EXHAUST** Not applicable in this case as the engine was not hot.

13.3.3. **ELECTRIC ARC** No possibility.

13.3.4. **OVERHEATED EQUIPMENT** The aircraft painting was in progress at the time of fire incident and fire burner was used to scrape the old paint. This is considered GOOD possibility.

13.3.5. **AIR BLEED SYSTEM** Not applicable here.

13.3.6. **STATIC DISCHARGE** No possibility as there was no static source available. Had it been there, the persons who were touching the aircraft at the time of fire incident, to scrape old paint must have been electrocuted already.

13.3.7. **LIGHTNING** No possibility of thunder storm as weather was absolutely clear.

13.3.8. **HOT BRAKES OR WHEEL** Not applicable in this case.

13.3.9. **FRICTION SPARK** There is a possibility of spark being created by friction either of burner or scrapper itself. The energy in friction spark depends on metal involved. Test have indicated that Aluminium or its alloys working on concrete will usually do not produce spark of sufficient energy for ignition. However sparks from stainless steel, Magnesium titanium will ignite fuel vapours.

13.3.10. **SMOKING MATERIAL** This have been ignition sources of several fire. Smoking is good possibility of spark creation to ignite either fuel or oil of aircraft.

13.4. Fire fighting equipment used & its effectiveness can be seen and judged by their performance with respect to burning material in the fire. However possibility of fire extinguishing related to medium is discussed as below:-

13.4.1. **FOAM TYPE** Foam is used to create an envelope to kill the oxygen over the burning material which helps fire progression. This is required when burning material have very low ignition point and very strong in burning like aircraft fuel, its engine oil and other alcohlic fluids. The fire was brought under control by utilizing foam type material.

13.4.2. **POWDER TYPE** Normally dry powder is used to extinguish fire of electric short circuits or static charges etc. This type of material was not used in this incident.

13.4.3. **WATER GLYCOL** This type of material is used to extinguish fire of wood, leaves grass, husk waste papers etc. This was also not utilized at the scene.

14. SURVIVAL ASPECT

14.1. It was a survivable incident. No person was reported injured or burnt.

15. **TEST & RESEARCH**

15.1. No required in this case.

16. **OBSERVATIONS**

16.1. On 27th September 1992, at 5.20 PM it was informed on telephone by Engr.Ghulam Murtaza, Controller of Airworthiness (South) QIAP Karachi that fire incident has occurred to M/S. Raji Aviation, Cessna-337 aircraft AP-BBX within their hangar and investigation board has been set up. The investigation team reached the scene of incident at 6.10 PM, upon arrival, fuel burning smell was noticed from the wreckage.

16.2. The inspection of the scene of accident showed totally burnt fuselage of aircraft with lots of black ash, sign of soot in the vicinity. The detail inspection of wreckage was however taken through **"STILL"** photography made at the scene under the supervision of Controller of Airworthiness (South) QIAP Karachi.

16.3. As far as the conditions of surroundings is concerned after the incident, it was showing signs of high flammed fire which includes burnt leaves and trunks of high trees. The ground was covered with mixture of foam with water alongwith fuel traces.

16.4. Nearly placed fire fighting equipment indicated that these were never used as found unmoved or undisturbed.

16.5. A funnel used for fuel/oil was found lying near the burnt wreckage of aircraft at the time of fire incident which indicates that some fluid was either being removed or being put in the aircraft.

17. INVESTIGATION

17.1. The investigation of incident was conducted to ascertain the following:-

17.1.1. Cause of incident.

17.1.2. Irregularity of aircraft maintenance procedures.

17.1.3. Spreading of the fire.

17.1.4. Information to the fire and rescue deptt.

17.2. To proceed with the incident investigation the probabilities of causes of fire were studied closely and it was established that:-

17.2.1. Low ignition point fuel was available.

17.2.2. Non-standard burner was available for aircraft paint scrapping.

17.2.3. Mis-handling of aircraft fuel.

17.2.4. Smoking near the fuel which was seen in the vicinity of the aircraft.

17.3. Contributing factor for spreading of fire were also investigated which are:-

17.3.1. **FAST BLOWING WIND** It was not present and weather was absolutely clear.

17.3.2. **COMBUSTIVE MATERIAL AVAILABILITY** The volume of fuel indicates that it was available in abundance which caused the burning of

aircraft with high flames. Aircraft fuel was most important and main contributing factor which was present in the aircraft fuel tank in measured quantity of 450 liters approximately.

17.3.3. **USE OF AIRCRAFT FUEL** The Mishandling of fuel was noticed due to the presence of funnel near the fire incident which was used to re-fuel or defuel the aircraft. The investigators noted that aircraft was fuelled consecutively thrice within the span of forteen days time period despite the fact that aircraft was not airworthy. So it can be assumed that the aircraft was being used to store fuel. This was tranferred to other aircrarft with the help of small plastic buckets. The presence of the funnel further corroborates this fact that Pakistan Burmah Shell supplies the fuel to the M/S. Raji Aviation through their automatic bowzers or small hand pumped carts.

17.3.4. **PRESENCE OF SPARK** Apparently nothing has been found near the wreckage which could be source of a spark like cigeratte or match box sticks. However detailed enquiry and related investigation revealed that non-standard burner was in use for aircraft paint scrapping paint which can easily produce spark near the aircraft when it was under defuelling. Question of **STATICS** also came under discussion but it was ruled out due to non-availability of its source and presence of aircraft bonding which is normal and routinely checked as per standard maint., practices.

17.3.5. **PART OF FIRE FIGHTING EQUIPMENT** The investigation revealed that fire deptt. of CAA was informed through control tower of aerodrome who further informed by "Follow me", available on the tarmac and as such fire fighting and rescue vehicles reached there within no time. However, it was gathered that affected operator M/s. Raji Aviation did not inform the concerned authorities about the fire incident of their aircraft at any time during the course of emergency.

18. **WITNESSES**

18.1. Witnesses statements are at Appendix D to N.

19. **DISCUSSION OF EVIDENCE**

19.1. The following evidences have a major bearing on the incident.

19.1.1. Presence of funnel near the scene of incident.

19.1.2. Fuel slip issued by M/S. PBS, K.A.P. on 27-9-1992, with D.R. No. 70 (copy attached as an appendix- (C-"3").

19.2. The still photography made at the scene of incident clearly shows that one "FUNNEL" is lying loose which was probably left near the aircraft at the scene when in use. It was heat of the fire which prevented from being picked up. It was being used in defuelling of aircraft when the incident took place.

19.3. The fuel slips issued by M/S. PBS indicates fuel charging as per quantity of fuel delivered from with their vehicle. The aircraft registration mark is appended on these receipts. These slips No. 068, 069 and 070 issued on 13th September 1992, 21-09-1992 and 27th September 1992, clearly indicate that fuel measuring 591, 588 and 450 liters was consecutively delivered to aircraft met with fire incident and it amounts to great irregularity of maint procedures as the aircraft was not being used and kept with full-fuel tanks.

19.4. The inspection of wreckage revealed that under the wing section fuel drain holes was with out cover and its cap was not available at the time of fire incident. Same was probably being used for defuelling.

20. FINDINGS

20.1. Aircraft was not airworthy at the time of fire incident.

20.2. Aircraft was carrying fuel measuring 450 Ltrs during fire.

20.3. Funnel was being used for aircraft defuelling. This is a gross violation of the maintenance procedures.

20.4. Non-standard burner was used for aircraft paint scrapping.

20.5. Wing section drain hole was found without its cap.

21. CAUSE

21.1. After studying all evidences, the probable cause of

the incident was wrong procedures adopted bay M/S. Raji Aviation for refuelling and defuelling. The fire was proabably initiated by a cigarette or non standard burner used for scrapping paint.

22. RECOMMENDATIONS

22.1. Standard procedures for aircraft refuelling/ defuelling should be followed strictly.

22.2. Concerned staff may be trained on aircraft fuel handling.

22.3. Standard burner should be used for aircraft paint scrapping with the approval of local Airworthiness Office.

22.4. M/S. PBS be advised to refuel the aircraft after checking aircraft Airworthiness document and noting thereof may be made on their slip.

22.5. M/s. Raji Aviation should be warned not to indulge in wrong practises of refuelling and defuelling. They should strictly abide by the existing maintenance procedures.

22.6. Airworthiness Branch CAA may be asked to design an Air Navigation Order for refuelling and defuelling aircraft procedures alongwith all necessary precautions required to be taken during the operation. This ANO should be issued to all operators alongwith strict instruction for compliance.

22.6. The concerned organisation may be warned to avoid use of non-standard procedures for aircraft defuelling. They should also ensure that there should be no smoking, fire work near the aircraft when its refuelling/defuelling is in progress. Installation of such playcarding be ensured in the premises of M/s.Raji Aviation.

App. "B1"

3

App. "B2"

App. "B3

4

App. "B4"

APP. "B5"

5

APP. "B6"

APP. "B7"

6

APP. "B8"

App. "B9"

7

App. "B10"

APP. "B11"