



**PAKISTAN CIVIL AVIATION AUTHORITY**  
**(SAFETY INVESTIGATION BOARD)**



**FINAL REPORT**

**M/S SCHON AIR PIPER SENECA – III (PA-34) AIRCRAFT**  
**REG # AP-BDK FORCED LANDING NEAR DHA CITY,**  
**KARACHI ON 20<sup>th</sup> OCTOBER, 2011**

## FINAL REPORT

### INVESTIGATION INTO SERIOUS INCIDENT OF M/s SCHON AIR PIPER SENECA – III (PA-34) AIRCRAFT, REG # AP-BDK NEAR DHA CITY KARACHI ON 20<sup>TH</sup> OCTOBER, 2011

#### Synopsis

On 20<sup>th</sup> October, 2011, Piper Seneca – III (PA-34) aircraft of M/s Schon Air Reg. No. AP-BDK took off from Nawabshah at 1040 LT for JIAP, Karachi. While en-route from Nawabshah and Karachi, mishap aircraft experienced right engine oil pressure drop and oil temperature rising along with visible oil leak from right engine area. To secure the affected right engine, it was feathered and flight was continued for destination with single engine. Ten minutes later, the left engine oil temperature also started rising and reached red zone coupled with drop in oil pressure. The cockpit crew also observed loss of power and drop in engine rpm. The mishap aircraft could not sustain level flight at the assigned altitude and made a forced landed at position N 25° 02.275', E 067° 26.687' (at 17 NM North East of JIAP, Karachi) adjacent to Super Highway at 1138 LT. All the three occupants onboard the mishap aircraft survived unhurt, however, the aircraft sustained substantial structural damage.

#### Investigation Authority

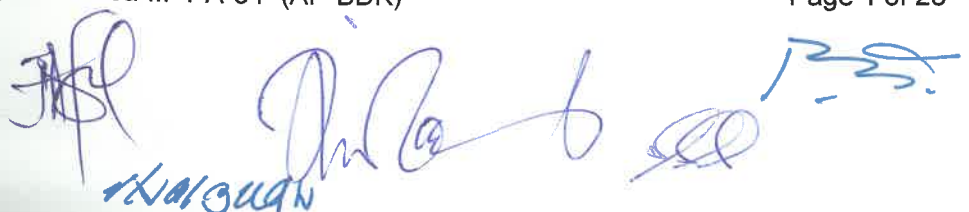
DG CAA issued notification vide Letter No HQCAA/1901/344/SIB/3034 dated 21<sup>st</sup> October, 2011 attached as Appendix "A" and authorised Safety Investigation Board, CAA Pakistan to investigate the serious incident. National transportation Safety Board USA appointed the Accredited Representative (AccRep).

#### 1. Factual Information

- 1.1. **History of the Flight.** On 20<sup>th</sup> October, 2011 M/s Schon Air the mishap aircraft was on a scheduled Training Flight from Karachi to Nawabshah and back. The Expected Time of Departure (ETD) was 0800 hrs, FL90, and fuel endurance 0300 hrs, with instructor pilot Captain Mazhar uz Zaman and a trainee pilot Mr. Malik Kamran to conduct circuits and landings at Nawabshah and then return to Karachi before returning to JIAP, Karachi.
- 1.2. **Injuries to Persons.** As a result of this serious incident no injury occurred to any person onboard the aircraft.

| Injuries | Crew | Passengers | Others | Total |
|----------|------|------------|--------|-------|
| Serious  | --   | --         | --     | --    |
| Minor    | --   | --         | --     | --    |
| None     | 02   | --         | 01     | 03    |

- 1.3. **Damage to Aircraft.** The mishap aircraft remained intact and in one piece on its belly after the forced landing, however it was estimated that aircraft had sustained substantial stresses and structural damages as shown below:-





- 1.4. **Cockpit crew information.** At the time of serious incident, there were three persons onboard the mishap aircraft which included Captain Mazhar uz Zaman {Instructor Pilot (Captain of the aircraft)}, First Officer Malik Kamran (Student Pilot) and Mr. Rasool Bux (a CAA Pakistan employee / passenger).

1.4.1. **Details of Instructor Pilot (Captain Mazhar uz Zaman)**

- ATPL No. : 681
- Date of Birth : 12<sup>th</sup> July, 1947
- Date of Initial Medical : 02<sup>nd</sup> February, 1967
- Date of Recent medical : 27<sup>th</sup> June, 2011
- Medical Validity up to : 31<sup>st</sup> December, 2011
- Total Flying Experience : 15,500 hrs
- Flight Hours as Captain : 15,000 hrs
- Flight Hours on Seneca III, PA-34: 5,000 hrs

1.4.2. **Details of Student Pilot (Malik Kamran Hussain):**

- CPL No. : 2973
- Date of Birth : 29.02.1988
- Date of Initial Medical : 16.07.2007
- Date of Recent medical : 25.04.2011
- Medical Validity up to : 31.10.2011
- Age : 23 years
- Total Flying Experience : 250 hrs
- Flight Hours as Captain : Under Training Pilot
- Flight Hours on Seneca III, PA-34: 04:00 hrs

- 1.5. **Aircraft Information.** The Piper Seneca – III (PA-34) aircraft was inducted by Schon Air on 25<sup>th</sup> June 2003 from M/s Phoenix (Pvt) Ltd. The detailed aircraft and engine related data as on 20<sup>th</sup> October, 2011 (the day of serious incident) is appended below:

1.5.1. **Aircraft**

- Aircraft Make / Model : Piper Seneca – III,
- Type of Aircraft : PA-34
- Year of Manufacturing : 1982
- Manufacturing Serial No : 8233009
- Aircraft Registration : AP-BDK,

- Aircraft Registration : AP-BDK,
- Aircraft Hours : 7505.55FH

#### 1.5.2. Engine

- Engine Type/Model : Teledyne Continental Motors (TSIO-360KB)
- Engine No 1 SN 811322-R : 1657.55 hrs
- Engine No 2 SN 812057-R : 1084.30 hrs HSO
- **Propeller** Propeller Type/Model : McCauley (3AF32C508/9-C/G-82NFA-6)
- Propeller No 1 SN 940442 : 510.30 hrs
- Propeller No 2 SN 941793 : 21.00 hrs

1.6. **Meteorological information.** The general weather was fit to undertake the training flight and no significant weather was reported. The weather reports are attached as Appendix "B".

1.7. **Navigation Aids Availability.** The Piper Seneca - III (PA-34) aircraft is equipped with ADF, VOR / DME and ILS equipment for the conduct of its training flight at Schon Air.

1.8. **Communication Aids Availability.** The Piper Seneca - III (PA-34) aircraft is equipped with VHF radio for its two way radio contact with all concerned and relevant agencies during the conduct of flight.

1.9. **Impact Information.** After the occurrence the survey of serious incident site was conducted, the important signs / rubbing marks of tyres on the rough surface and other related evidences were preserved through video and digital photography. Aircraft impacted the ground on main landing gears in the down and locked position as stated by Captain. Both the main landing gears broke away after forced landing. The right main landing gear then flew away and struck leading edge of right elevator. At about twenty feet from touchdown point dug marks of left Propeller were observed. The nose wheel was found housed in its well with door closed. The mishap aircraft stopped within approximately 150 feet of distance from the touchdown point after dragging its belly on ground. The pictorial views of the aircraft after forced landing and the site are as follow:



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- AIP PAKISTAN**

**INSTRUMENT APPROACH CHART - ICAO**

**AD ELEV 100' HEIGHTS RELATED TO RUNWAY THRESHOLD 25L ELEV 89'**

**APR 318.3  
121.8  
121.3  
ATTN 126.7**

**KARACHI/Hashmi Int'l FM MARVI HOLDING ILS Z RWY 25L**

**ADZ0PKC 01 JUL 13**

**BEARINGS ARE MAGNETIC ALTITUDES, ELEVATIONS AND HEIGHTS IN FEET DIST IN NM**

**VOR & DME REQUIRED**

**MSA 270M KC VOR**

**KARACHI ILS / DME 25L 11.2 DME FIX**

**MARVI ILS / DME 25L 15 DME EC 20 DME KC**

**DO NOT OVER SHOOT IN HOLDING AND RACE TRACK**

**SCALE 1:400000**

**TRANSITION LEVEL FL 300**

**TRANSITION ALT 3000'**

**MISSED APPROACH**

**CLIMB straight ahead until 2.5 DME, then turn on to heading 200° climbing to 2000'**

**ALMS, and contact ATIS RWY 25L**

**MISSED APPROACH (DME) Off Procedure: IQA**

**Alpha crossing VOR (see map) on to heading 200 DME (M) climbing to 2000' (2000') and contact ATIS**

**Altitude and field with RWY-05260000 2.5 NM SW of AD. Fillets between existing contours in identification of contour RWY before making approach to land RWY 07L or 07R of Karachi/Hashmi Intersection.**

**OCAT**

|                       | A         | B         | C         | D |
|-----------------------|-----------|-----------|-----------|---|
| Straight in           | ILS CAT 1 | 3000 (21) | 318 (229) |   |
| Approach              | GP INOP   | 470 (387) |           |   |
| GP INOP (without FAF) |           | 690 (607) |           |   |
| Circling              |           | 740 (651) | 892 (802) |   |

**Civil Aviation Authority**

**AMDT 01/12**

1.12.2. The JIAP Karachi detailed aerodrome data is appended below:

| OPKC AD 2.12 RUNWAY PHYSICAL CHARACTERISTICS |                     |                          |                                                                                                   |                           |                                                                       |
|----------------------------------------------|---------------------|--------------------------|---------------------------------------------------------------------------------------------------|---------------------------|-----------------------------------------------------------------------|
| Designations<br>RWY NR                       | True bearing        | Dimensions of<br>RWY (m) | Threshold (PCN) and<br>surface of RWY<br>and SWY                                                  | THR coordinates           | THR Elevation and highest<br>elevation of TDZ of precision<br>APP RWY |
| 07L                                          | 074.29              | 3200 x 46                | 54700000<br>CONCRETE<br>Able for ACFT<br>having Max TKOP<br>Weight Approx<br>43000 KG (117000 LB) | 245416.90N<br>067061.02E  | THR 23.50M / 77FT                                                     |
| 23R                                          | 254.29              |                          | 245444.65N<br>0671040.64E                                                                         | THR 30.40M / 100FT        |                                                                       |
| 07R                                          | 074.29              | 3400 x 46                | 87700000<br>CONCRETE<br>SWY surface                                                               | 245402.15N<br>0670833.66E | THR 21.62M / 71FT                                                     |
| 24L                                          | 254.29              |                          | 245431.75N<br>0671033.20E                                                                         | THR 27.29M / 89FT         |                                                                       |
| Designations<br>RWY NR                       | Slope of<br>RWY/SWY | SWY dimension<br>(m)     | SWY dimension<br>(ft)                                                                             | Obstacle Free Zone        |                                                                       |
| 07L                                          | 0.2% UP             | 305 x 46                 | 914                                                                                               | 3931 x 305                | -                                                                     |
| 23R                                          | 0.168% UP           | 305 x 46                 | 914                                                                                               | 3931 x 305                | -                                                                     |
| 07R                                          | 0.168% UP           | 305 x 46                 | 914                                                                                               | 3931 x 305                | -                                                                     |
| 24L                                          | 0.168% UP           | 305 x 46                 | 914                                                                                               | 3931 x 305                | -                                                                     |

Remarks: RWY 07R, 24L - 1004 X 120M

| OPKC AD 2.13 DECLARED DISTANCES (M) |      |      |      |      |         |
|-------------------------------------|------|------|------|------|---------|
| Designations<br>RWY NR              | TORA | ASDA | TODA | LDA  | Remarks |
| 07L                                 | 3200 | 3500 | 4114 | 3200 | -       |
| 23R                                 | 3200 | 3500 | 4114 | 3200 | -       |
| 07R                                 | 3400 | 3700 | 4270 | 3400 | -       |
| 24L                                 | 3400 | 3700 | 4270 | 3400 | -       |

OPKC AD 2.14 APPROACH AND RUNWAY LIGHTS

| Designations<br>RWY NR | APCH LGT<br>type LEN<br>INTST | THR LGT<br>colour<br>WBAR | VASIS<br>(MCH)<br>PAPI     | TODR LGT<br>LEN | RWY Centre<br>line LGT<br>Length,<br>spacing,<br>colour, INTST | RWY EDGE<br>line LGT<br>Length,<br>spacing,<br>colour, INTST | RWY End<br>LGT<br>colour<br>WBAR | SWY LGT<br>LEN (m)<br>colour | Remarks    |
|------------------------|-------------------------------|---------------------------|----------------------------|-----------------|----------------------------------------------------------------|--------------------------------------------------------------|----------------------------------|------------------------------|------------|
| 07L                    | SALS LH                       | GREEN                     | PAPI<br>Left 3'            | -               | -                                                              | 3200 M<br>60 M                                               | RED                              | -                            | Stroke LGT |
| 23R                    | PALS LH                       | GREEN                     | PAPI<br>Left 3'            | -               | -                                                              | WHITE LH                                                     | RED                              | -                            | -          |
| 07R                    | SALS LH                       | GREEN                     | PAPI<br>Both sides<br>2.5' | -               | 3400M 30 M<br>white LH                                         | 3400 M<br>60 M, white<br>LH                                  | RED                              | -                            | -          |
| 24L                    | PALS LH                       | GREEN                     | PAPI<br>Both sides<br>2.5' | -               | Last 600 M<br>alternate<br>white/red                           | Last 600 M<br>yellow                                         | RED                              | -                            | Flashers   |

| OPKC AD 2.16 ATS COMMUNICATION FACILITIES |                |           |                    |                |  |
|-------------------------------------------|----------------|-----------|--------------------|----------------|--|
| Service designation                       | Call sign      | Frequency | Hours of operation | Remarks        |  |
| TWR                                       | KARACHI Tower  | 118.3 MHz | H24                | Primary        |  |
|                                           |                | 118.6 MHz | H24                | Secondary      |  |
|                                           |                | 121.5 MHz | H24                | Emergency      |  |
| APRON                                     | Karachi Ground | 121.6 MHz | H24                | Primary        |  |
|                                           |                | 118.4 MHz | H24                | Secondary      |  |
|                                           |                | 121.8 MHz | H24                | Vehicle        |  |
|                                           |                | 123.0 MHz | H24                |                |  |
| ATIS                                      | ATIS           | 126.7 MHz | H24                |                |  |
| APP                                       | Karachi APP    | 125.5 MHz | H24                | Primary        |  |
|                                           | Karachi APP    | 121.3 MHz | H24                | Secondary      |  |
|                                           | Karachi APP    | 121.5 MHz | H24                | Emergency      |  |
| SS                                        | Radio          | 630 KHz   | HX                 | 2130-1900 Hrs  |  |
| SS                                        | Pakistan       | 1409 KHz  | HX                 | Variable SKEED |  |

| OPKC AD 2.19 RADIO NAVIGATION AND LANDING AIDS |             |                     |                       |                                                   |                                                |                                             |
|------------------------------------------------|-------------|---------------------|-----------------------|---------------------------------------------------|------------------------------------------------|---------------------------------------------|
| Type of aid,<br>CAT of ILS<br>(VAR VORLES)     | ID          | Frequency           | Hours of<br>operation | Site of<br>transmitting<br>antenna<br>coordinates | Elevation of<br>DME<br>transmitting<br>antenna | Remarks                                     |
| GP 25R                                         | Dots/Dashes | 334.4 MHz           | H24                   | 245448.11N 0671029.30E                            | -                                              | -                                           |
| ILZ 25R                                        | KC          | 110.10 MHz          | H24                   | 245441.864N 0670837.61E                           | -                                              | -                                           |
| ILS CAT I (1°E1995)                            |             |                     |                       |                                                   |                                                |                                             |
| LDM                                            | KC          | 235 KHz             | H24                   | 245447.724N 0671449.89E                           | -                                              | 3.9 NM FM THR                               |
| MM                                             | KC          | 75 MHz              | H24                   | 245443.00N 0671107.99E                            | -                                              | 0.57 NM FM THR                              |
| GP/DME 25L                                     | Dots/Dashes | 333.2 MHz CH34X     | H24                   | 245432.35N 0671013.98E                            | -                                              | 2.96° ROM 72 FT                             |
| ILZ 25L ILS CAT I<br>(1°E1995)                 | QDA         | 106.7 MHz           | H24                   | 245349.00N 0670820.94E                            | -                                              | -                                           |
| NDB                                            | KC          | 271 KHz             | H24                   | 245523.80N 0670935.21E                            | -                                              | Coverage 300NM                              |
| VOR/DME                                        | KC          | 112.1 MHz<br>CH 58X | H24                   | 245437.72N 0671035.61E                            | 37.53M                                         | Coverage 300NM<br>Radial 300<br>un-reliable |

- 1.13. **Fire.** No pre / post occurrence air / ground fire indications by cockpit crew of mishap aircraft and evidences of same by Investigation Team were observed.
- 1.14. **ATC Tape Extract.** ATC Tape Extracts were retrieved for detailed analysis and are attached as Appendix "D".
- 1.15. **CVR / FDR.** The Piper Seneca - III (PA-34) aircraft is not equipped with onboard CVR / FDR equipment.
- 1.16. **Survival Aspects.** Both the cockpit crew and the passenger onboard the mishap aircraft survived the serious incident without any injury.
- 1.17. **Test and Research.** Both the engines of mishap aircraft were taken to Continental Motors Inc. (CMI) USA, the OEM of engines, for detailed strip examination and analyses.
- 1.18. **Organisational and Management Information**
- 1.18.1. Schon Air Company is situated at Hamilton Hangar, JIAP, Karachi. It is a holder of AOC as a General Aviation Organization, primarily for undertaking Flying Training of PPL, CPL, ATPL, Charter Operations and Aerial Work. It also has Organizational approval as Approved Maintenance Organization (AMO) for the scope of work as defined in Organizational Approval. It has an inventory of multiple types of propeller aircraft along with required maintenance equipment.
- 1.18.2. The Company is authorized to undertake FITS courses for imparting required training for the Instructors' Rating. The Company maintains

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classrooms, On-campus hostel facility etc for the conducive training environment.

## **2. Analyses**

### **2.1. Operational Analysis.**

- 2.1.1. Due to less air traffic at Nawabshah vis a vis close proximity to JIAP Karachi, General Aviation aircraft prefer establishing proper camps or even proceeding to Nawabshah on daily basis. The mishap aircraft proceeded from JIAP, Karachi to Nawabshah for carrying out circuits and landings for training purposes.
- 2.1.2. The mishap flight to Nawabshah and back to JIAP, Karachi was an authorized training flight.
- 2.1.3. Both the cockpit crew had requisite flying experience, valid licences and Instructor Pilot had valid rating to undertake mishap flight. As per ANO-001-XXAM-2.0, flight crew with restrictions of OML or waivers are not to be grouped together. This necessitated that Instructor Pilot should not be on OML, whereas; contrary to the ANO the flight Instructor Pilot was on OML. However, this aspect had no bearing towards the causation of the serious incident.
- 2.1.4. At Nawabshah, aircraft carried out 08 circuits and landing and completed planned training requirement before making a full stop landing for taking rest.
- 2.1.5. The sequence of events of the mishap aircraft flight on the day of serious incident were as follow (all timing in local time reference (LT):
- 2.1.6. At 08:08:00 hrs mishap aircraft requested start up from Karachi Control Tower.
- 2.1.7. At 08:17:00 hrs mishap aircraft taxied out from General Aviation Hangar of JIAP, Karachi.
- 2.1.8. At 08:31:00 hrs the mishap aircraft was airborne from JIAP Runway 25L to proceed to Nawabshah and climbed to FL90.
- 2.1.9. At 09:16:00 hrs the mishap aircraft reached Nawabshah and carried out eight circuits and landings pattern.
- 2.1.10. At 10:10:00 hrs the instructor pilot switched off the mishap aircraft to have a short rest. During the operation at Nawabshah the cockpit crew did not observe or report any abnormality or malfunctioning of the aircraft or any of its systems / sub-systems.
- 2.1.11. From Nawabshah one of the CAA staff Mr. Rasool Bux got onboard the aircraft with the permission of the Captain to proceed to Karachi. This is an occasional practice (in violation to the documented procedures for a training flight) that CAA staff of Nawabshah airport avail these training flights from Nawabshah to Karachi.



- 2.1.12. At 10:34:00 hrs mishap aircraft again started up at Nawabshah with the intentions to proceed back to JIAP, Karachi.
- 2.1.13. At 10:37:00 hrs the aircraft took off from Nawabshah and was given climb to FL80 by Nawabshah ATC Tower Controller.
- 2.1.14. At 10:38:00 hrs when passing 1000 feet while climbing to FL80 mishap aircraft reported in contact with ACC JIAP, Karachi and was instructed by Nawabshah ATC to continue with ACC JIAP, Karachi.
- 2.1.15. At 10:38:10 hrs the mishap aircraft came in contact with ACC JIAP, Karachi and informed that it was climbing out of 1500 ft for FL80.
- 2.1.16. At 10:46:00 hrs the mishap aircraft requested to maintain FL60 which was approved by ACC JIAP, Karachi.
- 2.1.17. At 10:59:00 hrs the mishap aircraft was 65 nm short of Karachi on direct route to JIAP, Karachi.
- 2.1.18. At 11:09:28 hrs the mishap aircraft established radio contact with Karachi Approach radar and requested descent to 4500 feet which was approved.
- 2.1.19. At 11:10:04 hrs the Radar Controller asked the mishap aircraft to confirm changing to VFR Flight Plan. The instructor pilot informed the Radar Controller that they had problem with the aircraft and requested priority landing. The Radar Controller acknowledged and re-cleared the mishap aircraft direct to JIAP, Karachi.
- 2.1.20. At 11:12:29 hrs upon inquiry from Radar Controller about the nature of problem cockpit crew of mishap aircraft informed that they had problem with the Right Engine with no assistance required on arrival at Karachi and requested only priority landing.
- 2.1.21. At 11:12:49 hrs upon inquiry by the Radar Controller whether the affected right engine had been switched off, the cockpit crew confirmed that right engine had been switched off.
- 2.1.22. At 11:17:30 hrs the mishap aircraft transmitted to ACC JIAP Karachi 1145 LT as estimated time of arrival (ETA).
- 2.1.23. At 11:18:41 hrs the Radar Controller was informed that the aircraft was at 3500 feet and continuously losing altitude.
- 2.1.24. At 11:18:52 hrs the mishap aircraft informed that it was difficult to maintain altitude and the aircraft was gradually descending.
- 2.1.25. At 11:19:00 hrs the mishap aircraft requested shortest track to JIAP Runway 25L. The mishap aircraft was given radar vectoring by Radar Controller.
- 2.1.26. At 11:19:55 hrs ACC JIAP Karachi lost radar contact with the mishap aircraft and cockpit crew were informed accordingly.





- 2.1.27. At 11:21:05 hrs the cockpit crew informed Radar Controller that they were unable to respond to all the calls due to the handling of abnormal situation.
- 2.1.28. At 11:24:20 hrs the mishap aircraft reported 30 nm from Karachi at 2500 feet of altitude.
- 2.1.29. At 11:34:45 the mishap aircraft reported 19 nm from JIAP Karachi at 1300 feet.
- 2.1.30. At 11:37:11hrs the mishap aircraft reported making forced landing at 17 nm next to the Super Highway near DHA City, Nooriabad.
- 2.1.31. The instructor Pilot made a successful forced landing on unprepared surface.

## 2.2. Technical Analysis

2.2.1. **Onsite Aircraft Wreckage Examination and Analysis.** After aircraft forced landing, the wreckage site, the damaged aircraft and engines parts were examined with a view to establish cause(s) of engines' failure. A detailed analysis revealed that:

2.2.1.1. The propellers of both engines were still attached with respective assemblies, though bent, but intact and in one piece. This indicated that contact with the ground was made at relatively controlled and lesser speeds, and the aircraft did not travel much after touchdown.

2.2.1.2. Both the Engines' Propellers were found bent and damaged due to hitting with the ground. The propeller blade angles and damage pattern of both the propellers were significantly different from each other. The damage pattern was indicative of the fact that engine No 2 was at feathered position, and engine No 1 was running at power at the time of touchdown.



2.2.1.3. On impact, both the main landing gears broke and found scattered at the rear of the aircraft, meaning thereby that both the main landing gears were down at the time of impact. The Nose wheel, however, was found in its housing with doors closed. The positions of landing gears at the forced

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landing site indicated that pilot had lowered the gears just short of attempting the forced landing.

- 2.2.1.4. After both the main wheels broke away, the aircraft came on ground on its belly and continued to drag itself before coming to a halt. Hence, the aircraft sustained high stresses and the belly was badly damaged.
- 2.2.1.5. The oil of engine No 2 was found splashed on right side of fuselage and there were clear signs of leakage on the trailing edge of wing, however, such signature could not be verified from oil cooler, oil filter and oil sump etc. Thus, the oil from engine No 2 was found completely drained. However, no oil spillage was observed on ground at the occurrence site which indicated that the complete oil had leaked out in the air.
- 2.2.1.6. There was no sign of oil leakage from Engine No 1. Its oil quantity was checked and it was found about 6.8 Quartz.
- 2.2.1.7. **Oil Samples:** As there was no oil available in the right engine after forced landing, the oil sample of only left engine could be taken on the day of occurrence and was sent for SOAP to find out possible contamination and presence of metal particles. The SOAP report of PIAC Laboratory dated 2<sup>nd</sup> November, 2011 is placed at Appendix "E". Later, after shifting the aircraft at the site of Schon Air, the oil samples direct from the oil filters of both the engines were arranged for SOAP of right and left engines. The SOAP report conducted on 11<sup>th</sup> November, 2011 is attached as Appendix "F".

## 2.2.2. System / Documents Check

- 2.2.2.1. Due to poor performance in annual audit of M/s Schon Air for the period 2010-11 conducted by Controller of Airworthiness, cancellation of Organizational Approval was recommended Appendix "G" was carried out from 31<sup>st</sup> May – 1<sup>st</sup> June, 2011. The AOC was renewed wef 28<sup>th</sup> September, 2011 with its validity till 30<sup>th</sup> September, 2012.
- 2.2.2.2. Approval for Maintenance Organization was suspended on 22<sup>nd</sup> June, 2011 for 30 days due to significant violation of CAA Pakistan rules and regulations. Later on, provisional Maintenance Organization approval was accorded for three months with effect from 20<sup>th</sup> July till 19<sup>th</sup> October, 2011 Appendix "H" which was not renewed any further.
- 2.2.2.3. Although both engines have independent oil systems, yet the problem indicated in the cockpit seems to be of similar nature and in the same sequence.
- 2.2.2.4. Daily inspection checklist in use at M/s Schon Air contains an incorrect entry regarding oil quantity replenishment as (6 Quartz) Appendix "I", instead of 8 Qrts as per the engine technical publication. However, it was verified from the documents that oil was being replenished by Schon Air technical staff up to the specified dipstick level i.e. 8 Qrts Appendix "J".
- 2.2.2.5. During Check -1 (50 hrs/30 days) Appendix "K", it is mandatory to inspect oil lines and fitting for leaks, chaffing, dents and cracks as per



Teledyne continental Service Bulletin M86-6, latest version, however it was observed that this document was not available with engineering staff of M/s Schon Air.

2.2.2.6. Service Bulletin 03-3, and superseded M84-15, Appendix "L" illustrates requirement of carrying out differential pressure test to determine cylinder condition by measuring air pressure loss past the pistons, rings and valves as well as use of Master Orifice Tool to calibrate leakage checking equipment. However, cylinder compression check to ascertain leakage as per Table 1 of Service Bulletin was found inadequate and compression check values could not be confirmed by engineering staff of M/s Schon Air.

2.2.2.7. The Service Letter No L171 of TEXTRON Lycoming engine Appendix "M", being followed by the company for Spectrometric Oil Analysis Program (SOAP) is not appropriate for the Teledyne Continental Motors (TCM) / TSIO-360KB-7B engines. To inspect oil for the presence of metal particles as an aid in prevention of major failure, cut open the oil filter method at oil change is recommended by OEM Appendix "N". However, this method was not being utilized by M/s Schon Air to estimate wear rate of engine internal parts.

2.2.2.8. SOAP test of engine No 1 was carried out on 17<sup>th</sup> May 2011 Appendix "O" which indicated the presence of some metal particles, but no remedial actions were taken as there was no relevant document of OEM available with M/s Schon Air.

2.2.2.9. SOAP test report and compression check values submitted to CAA Pakistan by the company for life extension of engine No 1 was not validated against OEM document instead, M/s Schon Air was utilizing Lycoming document, and declared the test results satisfactory Appendix "P".

2.2.2.10. Post serious incident SOAP test report of engine No 1 at M/s PIAC laboratory conducted on 2<sup>nd</sup> November, 2011 Appendix "E" of the oil sample revealed that the metal particles increased as compared to the gradients of report of 17<sup>th</sup> May, 2011 Appendix "P" which was done for the grant of life extension. The values are thus indicative of a level of wear and tear of engine No 1 during the period from 17<sup>th</sup> May to 2<sup>nd</sup> November, 2011. The comparison is as appended below:

| Lab Report<br>(Engine No 1) | Fe    | Cr   | Al    | Cu   | Mg  | Si   | Ni   |
|-----------------------------|-------|------|-------|------|-----|------|------|
| 17 May' 11                  | 187.3 | 11.3 | 19.2  | 4.4  | 1.2 | 11.2 | 39.3 |
| 02 Nov' 11                  | 258.5 | 19.4 | 226.4 | 15.7 | 7.3 | 34.4 | 23.4 |

2.2.2.11. The SOAP test results of the oil samples of both the engines taken out of oil filters after shifting of the engines to the company on 11<sup>th</sup> November 2011 Appendix "F" show the wear and tear trend of both the



engines in general and of the engine No 2 in particular. The values are appended below:

| Lab Report<br>(11 Nov 2011) | Fe    | Cr   | Al    | Cu   | Mg   | Si    | Ni   |
|-----------------------------|-------|------|-------|------|------|-------|------|
| Engine No 1                 | 251.8 | 19.4 | 170.1 | 10.5 | 7.4  | 32.2  | 20.0 |
| Engine No 2                 | 537.0 | 33.5 | 794.0 | 36.0 | 21.8 | 125.5 | 31.5 |

2.2.2.12. The fact that there was no record available with M/s Schon Air for "Oil filter cut" method or SOAP test before 17<sup>th</sup> May 2011 carried out for life extension of Engine No 1, it is concluded that preventive approach of monitoring the engine health and subsequent maintenance if required, was not in practice at M/s Schon Air.

2.2.2.13. Out of five technical authorized personnel deployed on this aircraft, all had limit authorization (LA) to work, except one license holder of Radio trade. Appendix "Q".

2.2.2.14. There were only few routine defects along with scheduled inspections found documented in technical and flight log books.

2.2.3. **Strip Examination & Analysis of Engines.** Both the engines were taken to Continental Motors Inc. (CMI) USA, the OEM of engines, for detailed strip examination and analyses. The No 1 (Left) and No 2 (Right) engines' reports are attached as Appendices "R" and "S" respectively. Salient points of the reports are appended below:

2.2.3.1. **Engine No 2 (S.No. 812057, Hrs 1084.30).**

2.2.3.1.1. *Cylinders No 4 and 5 exhibited detonation signatures. The pistons were damaged along the other edge and through the ring lands.*

2.2.3.1.2. *The magneto timing was found set at 24.5° BTDC; whereas, the CMI specification for this engine is 20° BTDC.*

2.2.3.1.3. *The piston faces and cylinder heads exhibited a minimal amount of combustion deposits.*

2.2.3.2. **Engine No 1 (S. No. 811322, Hrs 1657.55)**

2.2.3.2.1. *The inspection of this engine did not reveal any pre-impact abnormalities that would have prevented normal operation and production of rated horsepower.*

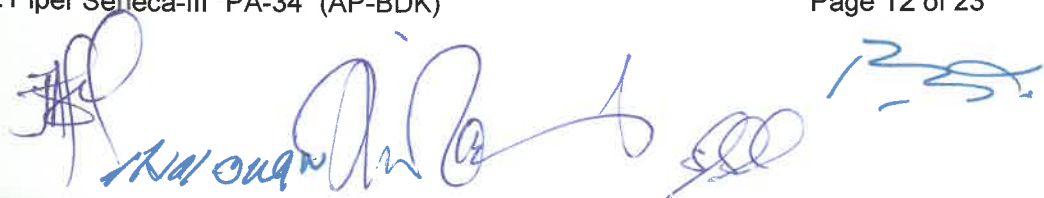
2.2.3.2.2. *The magneto timing was found set at 27° BTDC; whereas, CMI specification is 20° BTDC.*





## 2.2.4. Evidence Analysis

- 2.2.4.1. Although, the engines' health checks were being performed by subjecting the oil samples to Spectrometric Oil Analysis Program (SOAP); however, the values of metallic particles in oil were being checked against the documents of Lycoming instead of the standard documents of CMI. Similarly, the compression test results of the engine's cylinders were also checked against the documents of Lycoming engine.
- 2.2.4.2. The oil analysis reports of both engines after the serious incident reflected very high contents of metal particles in the oil system indicating that the internal condition of the engine had been badly deteriorated before the mishap.
- 2.2.4.3. The engine No 1 had completed 1657.55 hrs until the mishap and was being operated on calendar life extension. The Time Between Overhaul (TBO) for this engine is 1800 hrs and 12 years. Its calendar life expired on 23rd May, 2011 and operator availed one year calendar life extension in accordance with AWN0T-043-AWXX-4.0 (refer Appendix "T"). However, the SOAP and compression test results submitted as satisfactory by the operator for seeking calendar life extension were not compared with the OEM (CMI) specifications and instead were compared with the Lycoming engine's specifications.
- 2.2.4.4. Additionally, as per CMI, SIL No 98-9C (refer Appendix "U") the OEM does not allow the extension in calendar life TBO beyond 12 years. Therefore, calendar life extension was not justified.
- 2.2.4.5. The magneto timings of engine No 1 were found at 27 and engine No 2 at 24.5 degrees BTDC; while as per OEM (CMI) these should have been set at 20 degrees BTDC. In this mishap, the internal parts condition of both the engines had been already deteriorated which also remained undetected due to engines' health monitoring (through soap analysis and cylinders' compression check) against inapplicable publications. The improperly adjusted magneto timings worsened the situation.
- 2.2.4.6. As a result of incorrect magneto timings, detonation occurred in No 4 and 5 cylinders damaging their rings and pistons which subsequently caused excessive oil leakage, rise in oil temperature and drop in oil pressure.
- 2.2.4.7. After shut down of engine No 2, the cockpit crew as per procedure selected maximum continuous power on engine No 1 to reach the destination in minimum possible time. As engine No 1 had almost completed its life cycle and its internal condition was also deteriorated, it could not sustain the load and its oil temperature also started rising. Its magneto timings were also incorrect (27 instead of 20 degrees BTDC); however, detonation did not occur in any of its cylinders and increase in oil temperature coupled with drop in oil pressure and rpm took place. When the aircraft could no longer sustain safe level flight, the instructor pilot decided to force land the mishap aircraft.

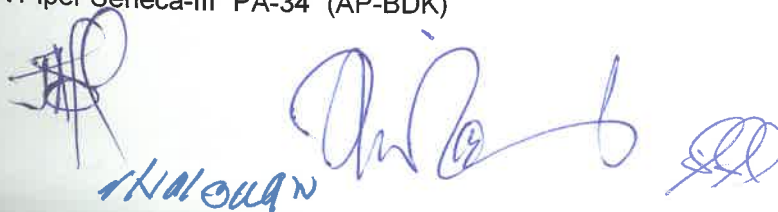


### 2.3. **ATS Analysis**

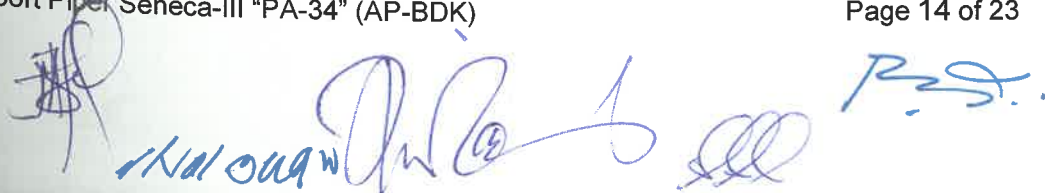
- 2.3.1. Since the mishap aircraft was not equipped with CVR and FDR, the ATS analysis is mostly based on ATC tape extracts attached as Appendix "C". After takeoff from Nawabshah, the aircraft was instructed by Area radar controller at 10:59:00 to contact Approach radar but cockpit crew did not contact the approach radar for ten minutes. Later, at 11:10:04 hrs, after the insistence of Controller, the cockpit crew informed radar that they had problem with the aircraft and requested priority on landing. Similarly, the switching off of the right engine was declared after seeking confirmation by the Controller.
- 2.3.2. ATS at JIAP accommodated mishap aircraft for direct to MARVI for RWY ILS 25L, and later on at 11:19:30 hrs adjusted for shortest route to Rwy 25L, as the aircraft had declared emergency situation due to continuous altitude loss.
- 2.3.3. At 11:18:52 the cockpit crew informed that it was difficult to maintain height and the aircraft is gradually descending. At 11:21:05 hrs the mishap aircraft informed radar controller about having emergency but it was not given due consideration by the ATS in terms of arranging Search and Rescue for the occupants and aircraft as the forced landing was expected in such circumstances. Mishap aircraft forced landed at 1138 hrs at 17 NM NE of JIAP, Karachi.
- 2.3.4. At time 1138 hrs Radar Controller informed PAF Masroor ATC Controller about the forced landing of mishap aircraft but did not specify the purpose of passing of this information. Hence no action was taken by PAF Masroor ATC controller for providing search and rescue services.
- 2.3.5. At 1141 hrs Captain of the aircraft called JIAP ATC using his Mobile phone and informed of their well being and the damage to the aircraft.
- 2.3.6. Scrutiny of the Emergency Response Plan (ERP) revealed that no proper SOP regarding forced landing by Civil aircraft, within or outside the vicinity of JIAP Karachi existed with Service Provider.
- 2.3.7. In the subject forced landing under investigation, fortunately no injuries to the occupants of the aircraft took place. However, in the case of a forced landing, chances of injuries to the occupants and fire to the aircraft cannot be completely ruled out. Timely and expeditious actions by Service Provider with regard to search and rescue operation can save precious lives, aircraft and property.

### 2.4. **Medical Analysis**

- 2.4.1. Upon incident, both the aircrew reported Aero Medical Centre, HQ CAA and were immediately taken to Agha Khan University Hospital Karachi for detection of alcohol and psycho-active substances and level of random blood sugar.



- 2.4.2. The reports were collected directly by CAA on 20<sup>th</sup> October, 2011. In the cases of both the aircrew, RBS was within normal range whereas other reports were "Negative" within normal range.
- 2.4.3. The Instructor Pilot was put on OML (Operation Multi-crew Limitations) by Central Aero Medical Board (CAMB) Karachi on 31<sup>st</sup> May, 2010 on account of non-specific plaques in proximal LAD and distal RCA.
- 2.4.4. Instructor Pilot appeared at CAMB on 29<sup>th</sup> November, 2010 when ECG revealed healed inferior MI. He was deferred pending ETT which was clinically positive for ECG evidence of myocardial ischemia (dated 26<sup>th</sup> November, 2010). Coronary angiography from Dr. Ziauddin Hospital dated 16<sup>th</sup> December, 2010 revealed 5-10% plugging in proximal LAD, 15% plugging in mid LAD and 5-10% ostial plugging in circumflex Attachment M.5 (D26.4.1.5)
- 2.4.5. Instructor Pilot was assessed fit with OML by CAMB, Karachi on 27<sup>th</sup> December, 2010.
- 2.4.6. Instructor Pilot last CAMB was conducted on 27<sup>th</sup> June, 2011 when he was assessed fit on OML.
- 2.4.7. The Student Pilot, was a CPL holder and was undergoing Multi-Engine rating on Seneca III, PA-34 aircraft.
- 2.4.8. On 13<sup>th</sup> July, 2009 the medical examination of Student Pilot was conducted at CAMB Karachi and was put on OML on account of supra ventricular ectopic activity. Holter monitoring dated 16<sup>th</sup> July, 2009 revealed occasional atrial ectopic activity and prolonged R-R interval. Holter monitoring dated 1<sup>st</sup> April, 2010 revealed intermittent atrial ectopy.
- 2.4.9. Cardiologist on 9<sup>th</sup> April, 2010 opined that Student Pilot had isolated supra ventricular ectopics. ETT dated 16.3.2011 also revealed intermittent atrial ectopy.
- 2.4.10. The Student Pilot appeared at CAMB Karachi on 25<sup>th</sup> April, 2011 and was assessed fit on OML.
- 2.4.11. Both the aircrew were in age permissible limits for flying, and possessed valid Medical Certificate. However, they both were on "Operation Multi-crew Limitations" attached as Appendix "V". Flight crew with restrictions of OML or waivers are not to be grouped together in pairs. In this case as Student Pilot was not yet a rated aircrew, Instructor Pilot on OML is contrary to the spirit of OML. Violation of Rules for OML has therefore been observed.
- 2.4.12. The limitation "Valid only as or with qualified co-pilot" is to be applied when the holder of a CPL or an ATPL does not fully meet the Class – I Medical Certificate requirements but is considered to be within the accepted risk of incapacitation. As per para D11.6 of ANO-001-XXAM-2.0 attached as Appendix "V". flight crew with restrictions of OML or waivers are not grouped together in pairs.

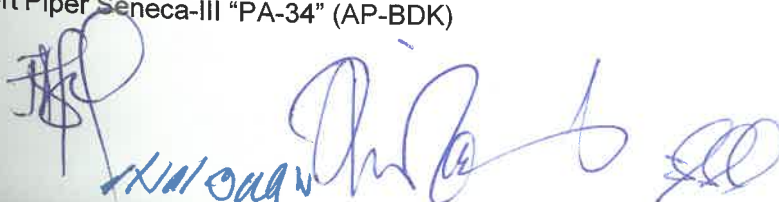


- 2.4.13. As per the paras D 11.5-11.8 of ANO-001-XXAM-2.0 attached as Appendix "V" airline Doctors should invariably work with the roster making authorities to ensure that Flight Safety is not compromised. Schon Air being a training institution did not have such an arrangement, thus roster maker (Scheduling in-charge) remained ignorant of the OML limitation on Instructor Pilot.

### 3. Findings

#### 3.1. Operational

- 3.1.1. The training flight was duly authorized by the Schon Air Management on the day of occurrence.
- 3.1.2. The weather was fit to undertake the said training flight on the day of occurrence.
- 3.1.3. The cockpit crew was qualified as per existing rules and regulations in vogue for the conduct of said training flight.
- 3.1.4. The mishap aircraft carried out eight circuit and landings pattern at Nawabshah before switching off the aircraft for taking a short rest.
- 3.1.5. From Nawabshah one of the CAA staff Mr. Rasool Bux got onboard the aircraft with the permission of the Instructor Pilot to proceed to JIAP, Karachi in violation to the documented procedures for a training flight.
- 3.1.6. At 10:34:00 hrs mishap aircraft again started up at Nawabshah with the intentions to proceed back to JIAP, Karachi.
- 3.1.7. At 10:37:00 hrs the aircraft took off from Nawabshah and was given climb to FL80 by Nawabshah ATC Tower Controller.
- 3.1.8. At 10:38:00 hrs when passing 1000 feet while climbing to FL80 mishap aircraft reported in contact with ACC JIAP, Karachi and was instructed by Nawabshah ATC Tower Controller to continue with ACC JIAP, Karachi.
- 3.1.9. At 10:38:10 hrs the mishap aircraft came in contact with ACC JIAP, Karachi and informed that it was climbing out of 1500 ft for FL80.
- 3.1.10. At 10:46:00 hrs the mishap aircraft requested to maintain FL60 which was approved by ACC JIAP, Karachi.
- 3.1.11. At 10:59:00 hrs the mishap aircraft was 65 nm short of Karachi on direct route to JIAP, Karachi.
- 3.1.12. At 11:09:28 hrs the mishap aircraft requested for descent to 4500 feet which was approved by ACC JIAP Karachi.
- 3.1.13. At 11:10:04 hrs the Radar Controller asked the mishap aircraft to confirm changing to VFR Flight Plan. The instructor pilot informed the Radar Controller that they had problem with the aircraft and requested priority





landing. The Radar Controller acknowledged and re-cleared the mishap aircraft direct to JIAP, Karachi.

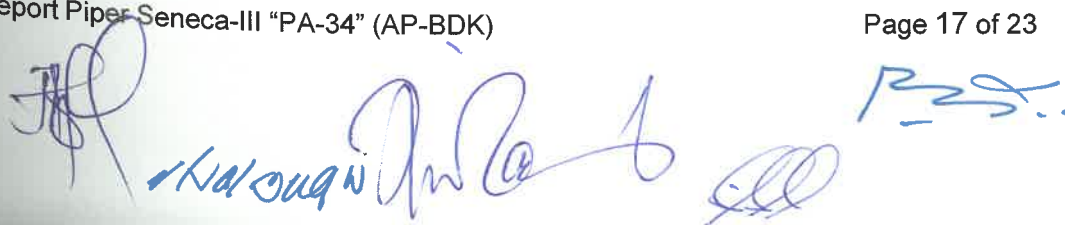
- 3.1.14. At 11:12:29 hrs upon inquiry from Radar Controller about the nature of problem the cockpit crew informed that they had problem with No 2 (Right) Engine with no assistance required on arrival at Karachi and requested only priority landing.
- 3.1.15. At 11:12:49 hrs upon inquiry by the Radar Controller whether the affected right engine had been switched off, the cockpit crew confirmed that right engine had been switched off.
- 3.1.16. At 11:17:30 hrs the mishap aircraft transmitted to ACC JIAP Karachi 1145 LT as estimated time of arrival (ETA).
- 3.1.17. At 11:18:41 hrs the Radar Controller was informed that the aircraft was at 3500 feet and continuously losing altitude.
- 3.1.18. At 11:18:52 hrs the cockpit crew informed that it was difficult to maintain altitude and the mishap aircraft was gradually descending.
- 3.1.19. At 11:19:00 hrs the cockpit crew requested shortest track to JIAP, Karachi runway 25L. The mishap aircraft was given radar vectoring by Radar Controller.
- 3.1.20. At 11:19:55 hrs ACC JIAP Karachi lost radar contact with the mishap aircraft and cockpit crew were informed accordingly.
- 3.1.21. At 11:21:05 hrs the cockpit crew informed Radar Controller that they were unable to respond to all the calls due to the handling of abnormal situation.
- 3.1.22. At 11:24:20 hrs the mishap aircraft reported 30 nm from Karachi at 2500 feet of altitude.
- 3.1.23. At 11:34:45 the cockpit crew reported 19 nm from JIAP Karachi at 1300 feet.
- 3.1.24. At 11:37:11hrs the cockpit crew reported making forced landing at 17 nm next to the Super Highway near DHA City, Nooriabad due to his inability to maintain altitude.
- 3.1.25. The instructor Pilot successfully and safely executed the forced landing of mishap aircraft near DHA City, Nooriabad, Karachi.
- 3.1.26. The Instructor Pilot carried out correctly all the recommended remedial checklist actions for handling abnormal situation in air.

### 3.2. Technical Findings

- 3.2.1. On 20<sup>th</sup> October, 2011, the mishap aircraft was serviceable and had no outstanding defect related to the engines.



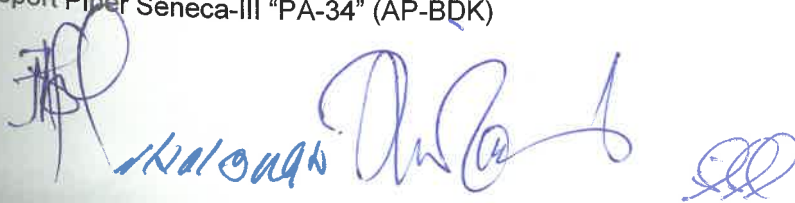
- 3.2.2. The aircraft was properly serviced before the scheduled training flight. However, the Maintenance Organization approval, that was already provisionally approved after its suspension on 22<sup>nd</sup> June, 2011 owing to non conformances to the standard and recommended maintenance practices, had expired a day before the occurrence i.e, on 19<sup>th</sup> October, 2011.
- 3.2.3. The field offices of the CAA Pakistan could not avert maintenance and servicing of the mishap aircraft by M/s Schon Air whose Maintenance Organization approval was invalid on the day of occurrence.
- 3.2.4. The flight from JIAP, Karachi to Nawabshah was uneventful.
- 3.2.5. The mishap aircraft at the time of occurrence was in relatively lighter configuration, as it had consumed more than half of the total fuel quantity and had 03 persons onboard against the capacity of 06 with no baggage or additional weight.
- 3.2.6. During the return flight from Nawabshah to JIAP, Karachi, engine No 2 oil temperature started to rise and oil pressure dropped along with heavy physical oil leakage.
- 3.2.7. The engine No 2 was feathered to avoid unwanted drag and switched off subsequently.
- 3.2.8. The flight was continued with single engine No 1 operation.
- 3.2.9. After about ten minutes of flight with single engine, engine No 1 oil temperature also started to rise coupled with drop in oil pressure and engine rpm.
- 3.2.10. When it was observed that the mishap aircraft could no longer sustain level flight with reduced engine efficiency, the flight was discontinued and a forced landing was made about 17 nm short of JIAP, Karachi.
- 3.2.11. The aircraft suffered severe structural damages; however, all souls onboard remained unhurt.
- 3.2.12. Oil samples tested through Spectrometric Oil Analysis Program (SOAP) after the forced landing indicated very high contents of metal particles in the oil systems of both the engines.
- 3.2.13. Magneto timings of both the engines were improperly adjusted to 27 degrees on Engine No 1 and 24.5 on Engine No 2 instead of 20 degrees as prescribed by the OEM.
- 3.2.14. Incorrect magneto timings is one of the causes of detonation in piston engines.
- 3.2.15. Strip examination of Engine No 2 revealed detonation in its cylinders No. 4 & 5 along with damage to their pistons and rings.
- 3.2.16. The damaged pistons and rings resulted into heavy oil leakage from engine No 2.



- 3.2.17. The Engine No 1 had already completed 1657 FH against 1800 FH {Time Between Overhaul (TBO) for this type of engine}.
- 3.2.18. The Engine No 1 had also completed its calendar life on 23rd May, 2011 and the operator availed one year life extension in accordance with the existing rules vide AWN0T-043-AWXX-4.0 to complete the remaining Flight Hours before overhaul. However, the approval of calendar life extension in TBO could not be verified from the OEM technical documents.
- 3.2.19. The oil samples and engine cylinders compression test results submitted by M/s Schon Air for seeking calendar life extension were incorrect as those were compared against the engine publications of Lycoming instead of Teledyne Continental Motors' Inc.
- 3.2.20. The post serious incident oil samples test results revealed that the metal particles were in much higher number as compared to those reflected in the test results of 17<sup>th</sup> May, 2011 when the oil samples were tested for seeking calendar life extension of Left Engine. It clearly points to the deterioration of the engine's internal parts.
- 3.2.21. The degenerated health of No 1 Engine's internal parts remained undetected during oil samples tests through SOAP and engine cylinders' compression tests since the results of those tests were being compared against inapplicable publications by M/s Schon Air.
- 3.2.22. With already degenerated health and incorrect magneto timings, the Engine No 1 could not provide optimum efficiency and sufficient power to maintain level flight independently (as it was operating solely due to Engine No 2 already switched off). As a result, its oil temperature started to rise along with drop in oil pressure and engine rpm.
- 3.2.23. Due to the inability of Engine No 1 to solely sustain safe flight, a successful forced landing was made.

### 3.3. **ATS Findings**

- 3.3.1. The mishap aircraft was not equipped with CVR and FDR equipment.
- 3.3.2. At 11:10:04 hrs, after the insistence of Controller, the cockpit crew informed radar controller that they had problem with the aircraft and requested priority on landing.
- 3.3.3. The switching off of the engine No 2 (right) was not communicated by the cockpit crew till the time radar Controller asked about it.
- 3.3.4. At 11:19:30 hrs the mishap aircraft was adjusted for shortest route to Rwy 25L, as the aircraft had declared emergency situation due to continuous altitude loss.
- 3.3.5. At 11:18:52 the cockpit crew informed that it was difficult to maintain height and the aircraft is gradually descending.



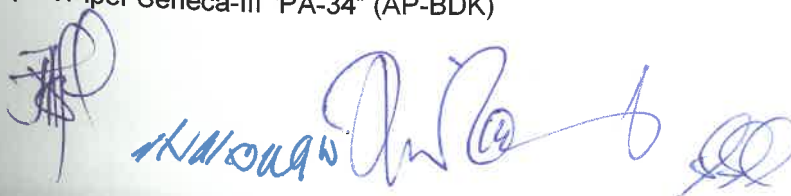
- 3.3.6. ATS did not give due consideration towards coordinating Search and Rescue effort for the occupants and aircraft as the forced landing was expected in such circumstances.
- 3.3.7. Mishap aircraft forced landed at 1138 hrs at 17 NM NE of JIAP, Karachi.
- 3.3.8. At time 1138 hrs Radar Controller informed PAF Masroor ATC Controller about the forced landing of mishap aircraft but did not specify the purpose of passing of this information.
- 3.3.9. PAF Masroor ATC controller did not take any action as the information was not passed by radar controller for launch of search and rescue services.
- 3.3.10. Scrutiny of the Emergency Response Plan (ERP) revealed that no proper SOP regarding forced landing by Civil aircraft, within or outside the vicinity of JIAP Karachi existed with Service Provider.

#### 3.4. Medical Findings

- 3.4.1. The blood and urine medical test reports in respect of both cockpit crew did not reveal any anomaly.
- 3.4.2. The Instructor Pilot was put on OML (Operation Multi-crew Limitations) by Central Aero Medical Board (CAMB) Karachi.
- 3.4.3. Instructor Pilot last CAMB was conducted on 27<sup>th</sup> June, 2011 when he was assessed fit on OML.
- 3.4.4. After the medical examination of the Student Pilot on 13<sup>th</sup> July, 2009 he was put on OML on account of supra ventricular ectopic activity.
- 3.4.5. The Student Pilot appeared at CAMB Karachi on 25<sup>th</sup> April, 2011 and was assessed fit on OML.
- 3.4.6. Both the aircrew were in age permissible limits for flying, and possessed valid Medical Certificate. However, they both were on "Operation Multi-crew Limitations".
- 3.4.7. Aviation medical advisor was not available at M/s Schon Air.

#### 4. Observations

- 4.1. During Check -1 (50 hrs/30 days) carried out on 22<sup>nd</sup> June 2011, Maintenance Release (MR) and Certificate of Release to Service (CRS) were declared invalid for three months by Airworthiness due to suspected malpractices.
- 4.2. Certificate of Airworthiness (C of A) of the mishap aircraft had become invalid in the month of June 2011 due to non conformances and its operation was suspended by Directorate of Airworthiness. Same was subsequently renewed on 27<sup>th</sup> September, 2011.
- 4.3. Out of five technicians deployed to work on PA-34 aircraft, four had limited authorization (LA) and only one was a license holder of Radio trade.





- 4.4. Daily inspection checklist in use at M/s Schon Air contains an incorrect entry regarding oil quantity replenishment as 6 quartz, instead of 8 quartz as per the engine technical publication.
- 4.5. Teledyne Continental Motor service bulletin M86-6, to inspect oil lines and fittings for leaks, chaffing, dents and cracks was not available with M/s Schon Air Maintenance Organization; but the signatures were being endorsed regularly on work sheet during Check -1.
- 4.6. In the absence of OEM standard document, the Service Letter No L171 of Lycoming Engine regarding conduct of Spectrometric Oil Analysis Program (SOAP) was found in practice with the company, but even that was not being followed on regular intervals.
- 4.7. OEM recommended "Cut open the oil filter" method at oil change was not being followed to inspect the presence of metal particles as an aid to prevent subsequent major failure.
- 4.8. Timely information regarding exact nature of technical problem was not communicated to ACC JIAP Karachi Controller by the cockpit crew.
- 4.9. Information of switching off one engine was transmitted by the cockpit crew to ACC JIAP, Karachi with delay and that too upon insistence of the controller.
- 4.10. Available rescue efforts could not be launched to recover the onboard personnel for the earliest possible medical assistance.
- 4.11. Timely and expeditious actions for search and rescue after the serious incident were not initiated primarily due to the fact that proper SOP regarding handling of a forced landing by civil aircraft, within or outside the vicinity of JIAP Karachi did not exist with CAA Pakistan on the day of occurrence.
- 4.12. Both the cockpit crew were on OML and scheduled to undertake the mishap training flight contrary to the CAA Pakistan rules / regulations.

## 5. Conclusion

- 5.1.1. The training flight on sector Karachi-Nawabshah-Karachi was an authorized flight. Both the cockpit crew had requisite flying experience and valid licences. The Instructor Pilot had required ratings to undertake such flights.
- 5.1.2. During the return training flight from Nawabshah to JIAP, Karachi oil pressure started to drop and rise in oil temperature along with physical oil leakage was observed by the cockpit crew on Engine No 2. The oil leakage resulted from the damaged pistons and rings of cylinders No 4 and 5 of Engine No 2 due to denotation in said cylinders caused by improperly adjusted magneto timings.
- 5.1.3. The engine No 2 was timely feathered by the instructor pilot and maximum continuous power was selected on engine No 1. As per the Multi-Engine aircraft procedures, shortest route to JIAP, Karachi was executed to land as soon as possible. However, engine No 1 failed to provide maximum continuous power for more than 10 minutes after which its oil temperature



started rising with drop in oil pressure. As the mishap aircraft could no longer sustain level flight for reaching the destination, a forced landing was made on unprepared surface at around 17 nm from JIAP, Karachi.

- 5.1.4. The failure of engine No 1 to provide optimum efficiency and sufficient power to sustain single engine safe flight is attributed to its already degraded health because of near overhauled life completion (operating on calendar life extension contrary to the OEM instructions), poor cylinders compression ratio and improperly adjusted magneto timings.

### **Finalization**

- 5.2. Various factors contributed directly and indirectly towards the causation of serious incident of mishap aircraft forced landing. Engine No 2 failed due to heavy oil leakage as a result of denotation in cylinders No 4 and 5 caused by improperly adjusted magneto timings resulting in damage to the respective pistons and rings. The inability of Engine No 1 to sustain safe flight with single engine operation was the result of its already degraded health because of near overhauled life completion (operating on calendar life extension contrary to the OEM instructions), poor cylinders compression ratio and improperly adjusted magneto timings.
- 5.3. The contributory factors included poor maintenance working ethics and non conformance of OEM recommended procedures at operator level to maintain the engines of mishap aircraft.

### **6. Safety Recommendations**

- 6.1. All General Aviation operators having Teledyne Continental Motors Inc. engines installed on the aircraft held on their inventory are to ensure that OEM recommended "Cut open the oil filter" method at every oil change is utilized to inspect for metal particles as an aid to determine the condition of engine's internal parts and prevent impending major engine failure.
- 6.2. All General Aviation operators and maintenance organizations are to study and implement oil samples testing through Spectrometric Oil Analysis Program (SOAP) on a regular basis in consultation with the respective OEMs and Directorate of Airworthiness, CAA Pakistan for monitoring engine's health.
- 6.3. All operators and maintenance organizations are to ensure that Daily Inspection Checklist is reviewed and all specifications be mentioned as per the respective OEM operational and technical publications.
- 6.4. All operators and maintenance organizations are to ensure availability of and adherence to the applicable OEM operational and technical publications, Safety Bulletins and Airworthiness Directives.
- 6.5. All operators and maintenance organizations are to ensure that non standard and irrelevant documents are not placed in the organisation / work centre.



- 6.6. All operators and maintenance organizations are to ensure that authentication of scheduled inspections and evaluations / tests, etc. are accomplished and ensured against the OEM recommended standards.
- 6.7. CAA Pakistan is to ensure verification of SOAP and all other relevant test results against authentic OEM recommended standards while scrutiny of maintenance actions and relevant documents before granting life extensions to aircraft, engine or their components / parts.
- 6.8. All operators are to study and implement fool proof procedures at organizational level to ensure strict implementation and conformance to CAA Pakistan approved OML limitations during flying operations.
- 6.9. All operators are to ensure the availability of Aviation Medical Advisor at organizational level.
- 6.10. All operators are to re-emphasize on all cockpit crew to communicate the abnormal situation to ground controlling agencies at the earliest for ensuring quick evacuation of onboard personnel and proper preservation of onsite evidence.
- 6.11. CAA Pakistan is to study and review the existing Airworthiness Notice No. Awnot-043-AWXX-4.0 to bring it in line with OEM recommendations regarding TBO extension.
- 6.12. CAA Pakistan is to study and devise mechanism for strict implementation of her directives on OML limitations.
- 6.13. All CAA Pakistan personnel be strictly advised not to request for boarding any training flight.
- 6.14. CAA Pakistan is to study and devise procedure for timely initiation of search and rescue operation in case of any contingency.

*BS:*