Submission to

Senate Standing Committees on Rural and Regional Affairs and Transport

On

Aviation Accident Investigations (Pel Air)

By

Richard James Davies

Senate Committee Submission

1. This submission is made to the Senate Standing Committees on Rural and Regional Affairs and Transport on Aviation Accident Investigations (Pel-Air), reporting date 29 November 2012.

2. I make this submission as an individual who is concerned regarding the standards and practices of the Australian Transport Safety Bureau (ATSB) and the Civil Aviation Safety Authority (CASA), as exhibited in the matters relating to the accident on 18 November 2009 involving the Westwind II aircraft, registered VH-NGA, operated by Pel-Air Pty Ltd.

3. I became involved in this matter at the request of parties involved or associated with the accident. My subsequent enquiries and analysis indicated deficiencies by both the ATSB and CASA in aspects that I have reviewed.

4. I address a limited range of issues regarding the accident based on the information provided to me by various persons or documentary sources that would have been available to CASA and the ATSB throughout their enquiries. I have attempted to source the most accurate information available to me within the short period I have been involved, and without undue imposition or demands beyond those available to a member of the public.

5. The issues I address relate to the considerations and implications of

   a) Fuel system and fuel on board,
   b) Fuel calculations,
   c) Crew awareness of weather conditions,
   d) Company fuel policy and flight planning, and
   e) Aircraft suitability for the task.

6. I will not reiterate explanations of terms as the ATSB report should provide sufficient background information and understanding.

7. It is my understanding that other parties will make submissions on other aspects relevant to this matter. A submission by Mr Bryan Aherne may refer to information in this submission.

Fuel System and Fuel on Board

8. The ATSB report (page 15), in its section on 'Fuel System', discusses the capacity of the aircrafts fuel system. However, it refers to the capacity in units of pounds (lbs) or kilograms (kg). These figures are incorrect in that they represent a weight (of fuel) and not a volumetric capacity of the tanks.

9. The ATSB report (page 3) acknowledges,
"the PIC arranged for the aircraft's main fuel tanks to be refuelled to full. No fuel was added to the tip tanks"

   This information correlates with that I have received independently.

10. The ATSB report frequently refers to a fuel load of 7330 lbs as being the main fuel tanks containing full fuel (pages 3, 16 and 32).

    The statement is incorrect for the reasons specified below. I am not aware where the ATSB obtained this figure from, however it is referred to in Pel-Air documentation as being the standard figure for full main tanks.

11. The relationship between the volume and the weight of fuel is dependent on the Specific Gravity (SG) of the liquid, in this case being the type of aviation fuel.

    There are several types of aviation fuel that may have been used in the accident aircraft (Pel-Air Westwind Cockpit Reference Handbook 3-23) and the SG of these varies.

    The SG is also affected by temperature and pressure.

12. To determine the amount of fuel as a weight, the amount as a volume and its SG must be considered. For example:

    Jet-A1 fuel may typically have an SG between 0.78 and 0.82

    Therefore 1100 US Gallons (4164 litres) of Jet A1 (a volume) may vary in weight between 7160 lbs (SG 0.78) and 7528 lbs (SG 0.82)

    This is a difference of 368 lbs, and would represent approximately an additional 36 minutes of flight time in a Westwind II (whilst holding airborne in the manner dictated for calculating Fixed Fuel Reserve).

13. My attempts to obtain the relevant 'fuel dockets' for the fuel delivered to the aircraft at NSFA were unsuccessful. These documents normally specify the SG of the fuel loaded, and may have been used to accurately calculate the weight of fuel onboard the aircraft preflight.

14. The Pel-Air Operations Manual (Part A, 0-1 Revision Original, Section – Conversion Factors) effectively specifies to use a SG of 0.78 for 'Avtur', irrespective of specific fuel type.

15. The aircraft had fuel tank capacities of 1100 USG for the main tanks, and an additional 230 USG for the wingtip tanks. Therefore, if the aircraft was fuelled to the main tanks being full, and an SG of 0.78 applied (as specified by Pel-Air), the aircraft had 7160 lbs of fuel on board preflight, not the reported 7330 lbs.

Fuel Calculations Premise

ATSB

16. The ATSB Report had a paucity of information regarding their methods of fuel and flight planning calculations.

    Scant details included:
    "The investigation used a BoM wind/temperature chart to derive the temperature at the cruising altitude as approximating ISA + 10°C."

    and that the calculation included:

    "The application of that temperature to the available aircraft performance figures and the PIC-anticipated 50 kts headwind to the relevant cruise speed from the AFM to the distance from Apia to Norfolk Island of 1,450 NM (2,688 km)"

    thus deriving:

    "resulted in an estimated planned fuel consumption of 5,550 lb (2,517 kg)."

17. The report does not specify the ATSB's methodology for calculations. I did obtain a copy of a "Jeppesen FliteMap" calculation, purportedly completed or commissioned by the ATSB for use in the investigation. No weight details are included in the document (eg Takeoff weight). However, for the correlating distance (1449 nm), altitude (FL390) and a 70 knot headwind the calculated fuel used was 5150 lbs.

    This document is attached as Annex A

    This is a difference of 400 lbs less despite an extra 20 kts of headwind. The reason for this anomaly could not be identified.

18. The report does not contain details of the calculated fuel remaining at any point enroute. Thus the basis for calculating the viability of diversions whilst enroute cannot be justified.

Pel-Air

19. The 'Pel-Air Operations Manual Part B' specifies

"16.5.1.1 The following planning data ***shall*** be used for Company Westwind operations."
(my emphasis)

However, in the very next paragraph states:

"16.5.2 Fuel Consumption and Block Speeds
16.5.2.1 The following table is a ***guide*** only to planning. Refer to A/C OPS Planning Manual for precise information."
(my emphasis)

The document then continues with planning information with fuel usage based on hourly time frames, irrespective of the weight of the aircraft. Similarly, a standard figure is used for True Air Speed (TAS), despite this also varying with weight and altitude.

20. The same document specifies:

"16.1.1.2 Any conflict between these SOP's and the AFM shall be reported to the Chief Pilot or a Westwind Check and Training PIC without delay. The AFM takes priority over the SOP's."

21. These various statements would appear confusing and contradictory, yet are contained in a manual accepted by CASA that is the primary reference source for the crew.

Davies

22. I was unable to obtain the Aircraft Flight Manual (AFM) specified above and have based my calculations on the

"Pel-Air Flight Operations Department Westwind Cockpit Reference Handbook & Operational Planning Manual";

which contains data prepared by Israel Aircraft Industries. The Introduction to which states:

"All data contained in this manual reflects actual performance during flight testing of a normally configured 1124 Westwind aircraft. … The operational data will permit detailed flight planning and inflight cruise control"

23. Intrinsic in the calculation of aircraft performance is consideration of the aircrafts weight. The ATSB report is taciturn on this aspect, as is the Pel-Air manuals. This lack of information makes comparative analysis of their calculations difficult.

24. Attached as Annex B are Load Data Sheets pertinent to VH-NGA.

25. Based on information supplied to me regarding the measured weight of the medical equipment, all persons and their baggage on board for the accident flight, in conjunction with the information in the Load Data Sheet, I calculated the Zero Fuel Weight (ZFW) of the aircraft on the accident flight to be 14606 lbs (6625 kg).

    These calculations are attached as Annex C

26. Combining the ZFW (14606 lbs) with the calculated fuel load of 7160 lbs (based on the volumetric capacity and the specified SG) resulted in a Ramp Weight of 21766 lbs. My subsequent fuel and performance calculations were based on this figure.

27. The method for fuel planning calculation I have used is based directly on those contained in the ATPL syllabus.

    It used data directly derived from the "Pel-Air Flight Operations Department Westwind Cockpit Reference Handbook & Operational Planning Manual"; as discussed above.

    The fuel calculations were completed for each leg of the flight; rather than the 'hourly based' calculations based on the Pel-Air Manual; which did not consider the variations due to aircraft weight.

28. The crew reported that a climb to FL390 was undertaken without significant delay. In some instances, due to a combination of altitude and temperature deviation (ISA+10) the parameters required are 'Off the chart' (such as the almost immediate climb to FL390). In this case I have applied the most appropriate charted figure for the calculation.

    The thrust setting / cruise technique used by the crew during the accident flight is not reflected in the Operational Planning Manual, however the Constant Speed Cruise M0.72 provides the closest approximation based on available data.

    I have calculated wind component for each leg that results in a flight time interval for the leg that accurately reflects the reported time over each waypoint.

29. The calculations make no allowance for fuel usage for start, taxi, takeoff, approach or landing. This is in accordance with the Pel-Air manuals accepted

by CASA. It is noted that Pel-Air have subsequently amended their directives to allow for fuel usage during these flight phases.

30. Annex D contains a spreadsheet calculation, and subsequent discussion will be derived from that document.

Fuel Calculations for Diversion

31. Based on these calculations, the fuel remaining on board at position DOLSI (at time 0839 UTC) was 2282 lbs (assuming the 10 percent Variable Fuel Reserve had been used to this point)

32. The ATSB report identified the "Approximate Last point of safe diversion to Noumea" as being between time 0902 UTC and 0928 UTC

33. At time 0904 UTC the crew received advice of a weather observation (SPECI) issued at 0902 UTC. As identified in the ATSB report, this was the first time the crew assimilated information about the deteriorating weather at YSNF.

34. Time 0904 UTC was 25 minutes after DOLSI, at an average Ground Speed of 352 kts and Fuel Flow of 1326 lb/hr. Therefore, the distance past DOLSI was 146 nm and fuel remaining was 1677 lb (assuming the 10 percent Variable Fuel Reserve had been used to this point)

    From a position on track 146 nm past DOLSI to NWWW was 436 nm

    Based on a diversion direct to NWWW at that time, at FL390 with a 20 kt headwind component throughout, having used 1409 lbs for the subsequent cruise and descent for the segment (assuming the 10 percent Variable Fuel Reserve has been used), the aircraft would arrive overhead to commence its approach and landing with 269 lbs ***total*** at time 1014 UTC

    Calculations for this are attached as Annex E.

35. Time 0928 UTC was 49 minutes after DOLSI. Based on the previous figures, the distance past DOLSI was 287 nm and fuel remaining was 1093 lb (assuming the 10 percent Variable Fuel Reserve has been used to this point)

    From a position on track 287 nm past DOLSI to NWWW was 410 nm

    Based on a diversion direct to NWWW at that time, at FL390 with no wind component throughout, having used 1214 lbs for the subsequent cruise and descent for the segment (assuming the 10 percent Variable Fuel Reserve has been used), the aircraft would not complete its diversion as it would run out of fuel, having a shortfall of 122 lbs

Calculations for this are attached as Annex F

36. By comparison, if the aircraft continued to YSNF (as planned) it would arrive with 709 lbs (Annex D)

37. Based on these calculations, the information contained in the ATSB report is incorrect.

Crew Awareness of Weather Conditions

38. The crew had obtained weather forecasts (TAF) for various locations, including NWWW and NFFN, prior to their departure from Australia on the day preceding the accident

39. Given for this outbound flight

"The flight departed Sydney Airport at about 1130" (ATSB Report page 1)

It is almost certain that the TAFs obtained by the crew were:

NFFN issued 0948 UTC, valid 1712/1812, and
NWWW issued 1035 UTC, valid 1712/1812

40. These two TAFs were still valid at the preflight planning time for the return flight (NSFA – YSNF), and covered the possible arrival times at these airports.

41. Upper level winds had been obtained by the crew prior to their departure from Australia on the day preceding the accident. It could not be determined if these were still valid at the time of the return flight

42. The planned arrival time at YSNF on the return flight was 18/0900 (ATSB report page 2).

43. The crew had obtained a new TAF for YSNF preflight for the return leg (issued 18/0437 UTC, valid 1806/1824) that was valid and covered the arrival time (ATSB Report page 3). It forecast conditions above the alternate minima. Trend forecasts appended were not applicable until after the planned arrival time, and were therefore nugatory.

44. Therefore, the crew had valid TAFs for NFFN, NWWW and the latest TAF for YSNF.

45. The ATSB report (page 16) acknowledges that TAFs were issued every 6 hours. Therefore, the crew had a reasonable expectation that another unamended TAF would not be issued until about 1030 UTC (validity 1200 to 0600); that is after the planned arrival time at YSNF.

This was the case; the two intervening TAFs issued at 0803 UTC and 0958 UTC were TAF AMD (Amendments) to the 0437 UTC TAF

46. When the crew requested weather from Fiji ATC at 0756 UTC the ATSB report (page 6) indicated the 0630 UTC METAR for YSNF was the latest available observation. In fact, two other METARS (0700 and 0730) and a SPECI (0739) had been issued prior to this time; none of which were passed to the crew.

47. At 0802 the crew was advised by Fiji ATC of a weather observation (SPECI) for YSNF at 0800 UTC of conditions below the alternate minima.

As reported (page 7), the crew did not have an awareness and/or appreciation of the 0800 UTC SPECI (observation). Therefore its influence on their decision making process was nugatory. The reason for the lack of awareness and/or appreciation is, in my opinion, inadequately examined in the report.

48. An amended TAF was issued at 0803 UTC

The ATSB report states
"The PIC … did not enquire as to the availability of an amended TAF …"

The crew were not required to make this enquiry, nor did they have a compelling reason to do so. At the time they possessed a valid TAF for the destination that forecast conditions above the alternate minima and were not aware of the significance of the SPECI that had been passed to them.

Fiji ATC did not pass on the information regarding the 0803 UTC TAF AMD; nor were they required too.

49. The TAF AMD 0803 UTC forecast cloud BKN010 (broken at 1000 ft above ARP), not 1100 ft as reported in the ATSB report (page 7).

50. The first time the crew became cognizant of a need to consider the option of an alternate aerodrome due to deteriorating weather at YSNF was 0904 UTC; by which time they had passed LPSD for NFFN (time 0845 UTC) (see para 54 and Annex G), and (based on the calculations above) the airport that would result in the greatest amount of fuel being available on arrival was YSNF. (See paras 35 and 36).

269 lb remaining at NWWW (less than FFR),
709 lb remaining at YSNF

51. The ATSB report (page 30) states:
"… once an aircraft has passed its PNR, the flight crew is unable to divert to an alternate aerodrome with fuel reserves intact. In such cases, if there was a subsequent deterioration in the weather conditions, a crew would be compelled to either continue to its destination in the hope of becoming visual

and being able to land, or to divert and arrive at an alternate aerodrome with less than the stipulated fuel reserves."

52. The Pel-Air Ops manual states

"8.5.2.2 If, as a result of an in-flight fuel check on a flight to a destination aerodrome, the expected fuel remaining at the point of last possible diversion is less than the sum of:
a) Fuel to divert to an enroute alternate aerodrome; and
b) Variable reserve fuel; and
c) Fixed reserve fuel.

The PIC shall either:
a) Divert; or
b) Proceed to the destination, provided that two separate runways are available and the expected weather conditions at the destination enable a successful approach and landing."

53. At 0904 UTC the latest TAF for YSNF was for conditions below alternate minima, but above landing minima. The latest observation (SPECI 0902 UTC) also identified weather conditions below alternate minima, but above landing minima. As such the crew could have a reasonable expectation of becoming 'visual' prior to the completion of an instrument approach and landed.

54. Given that the aircraft was past its 'last possible diversion' to arrive with FFR remaining, and at YSNF there were two separate runways, and the expected weather conditions were above landing minima, the crew complied with the Pel-Air procedure (as accepted by CASA).

55. By the time the crew obtained the 0930 SPECI at time 0932 their options were:

Proceed to YSNF to attempt a landing, irrespective of the conditions, or
Ditch in open water enroute to NWWW

Company Fuel Policy and Flight Planning

56. I have reviewed the following sections of Pel-Air Manuals

Part A Section 9.11
Part B Section 5.1 to 5.4
Part B Section 16.5

which relate to Fuel Policy and Flight Planning (and are approved by CASA)

57. The ATSB report (page 24) discusses the requirement
"for the operator to maintain an operations manual that provided guidance to

its pilots, and other operational personnel",

and that
"Operations manuals were to include information, procedures and instructions in respect of the safe operation of all the operators aircraft types."

58. The ATSB report claims
"the operator maintained an operations manual in accordance with CAR 215"

and that the operators manuals
"ensured compliance with the current regulatory requirements"

and
"The operators procedures and flight planning guidance managed risk consistent with regulatory provisions"

Part A Section 9.11

59. Part A Section 9.11 relates to Fuel, including

Company Fuel Policy
Critical Point
Point of No Return
Variable and Fixed Reserve Fuel Requirements
Latest Divert Time Point

60. The first paragraph of this section states:
"9.11.1.1 The Company fuel policy for all Company aircraft shall be as follows:
a) Details on fuel planning specific to aircraft types operated by the Company shall be in accordance with Part B, Section 6 – Flight Planning."

Part B Section 6 is not Flight Planning

61. Subsection b) of the above paragraph states 'Taxi Fuel' shall be carried. No figures were supplied in any manual for this amount.

62. Paragraph 9.11.1.3 states the PIC must include provision for fuel for approach and landing. No figures were supplied in any manual for this amount.

63. The ATSB report (page 29) discusses disparities between Pel-Air manuals with regard to Critical Point calculations.

64. The method specified in the manual for calculating CP is only pertinent for situations where the outbound and inbound tracks are identical. It does not accommodate 'Off Track CP', nor is there any guidance in any Pel-Air manual as to how to calculate this. An 'Off Track CP' calculation is more likely to be encountered than the one described in the manual, and was the situation encountered in the accident flight.

65. The method specified in the manual for calculating PNR is only pertinent for situations where the outbound and inbound tracks are identical. It does not accommodate calculations for suitable airports 'Off Track' (this calculation is more commonly referred to as Latest Point of Safe Diversion LPSD). There is no guidance in any Pel-Air manual as to how to calculate this.

Part B Section 5.1 to 5.4

66. The first paragraph of this section states:
"Flight planning for Company operations shall be:
a. in accordance with Company fuel policy at Part A-8-3"

Part A-8-3 is 'Suitability of Aerodromes/ALAs', not Flight Planning

67. The first paragraph of this section states:
"Flight planning for Company operations shall be:
b. in accordance with the Company fuel planning data for the particular type"

This contradiction is addressed in paragraph 19 to 21 of this document.

68. Critical Point and PNR calculations are addressed, with the same problems identified above being apparent

69. As discussed in paragraph 19, fuel consumption and speeds are based on hourly figures regardless of aircraft weight

Part B Section 16.5

70. Part B Section 16.5 reiterates the erroneous method of fuel consumption and block speeds regardless of weight.

Aircraft Suitability for Task

71. The submission by Mr. Aherne discusses the suitability of the aircraft for the tasks it was assigned. My analysis supports his submission with the consideration RVSM flight planning.

RVSM

72. The aircraft operated by Pel-Air, VH-NGA, was not approved for RVSM operations. Therefore operations should have been planned at Non RVSM flight levels. In the NFFF and NZAA FIRs this excludes FL290 to FL410 inclusive.

73. I completed calculations (Annex G) that considered the following scenario:

Flight NSFA to YSNF

ZFW 14840 lbs
Full fuel tanks of 1330 USG (Volumetric limit)
Fuel SG of 0.78
Takeoff Weight of 23500 lb (Max limit)
No fuel used for Start, Taxi or Takeoff (as per Pel-Air Manuals)
Temperature deviation of ISA+10 deg C throughout flight
Cruise at FL280 (Maximum Non RVSM level) to calculated LPSD
Cruise at Long Range Cruise performance (as per Operational Planning Manual)
50 kts headwind during Climb and Cruise to LPSD
LPSD calculated for Depressurised flight at 10000ft to NFFN
20 kts head or tail wind (as applicable) during cruise at 10000ft and descent to destination; either YSNF or NFFN
Variable Fuel Reserve used in flight
No fuel is used to turn, to reverse track to NFFN
No fuel used for Approach or Landing
No variation in fuel usage from Operational Planning Manual; such as from dirty or damaged airframe

74. Based on these conditions the aircraft can be planned to perform the flight.

75. It the event of a depressurization immediately after the LPSD to NFFN(depressurized) the aircraft could continue to YSNF and arrive with 747 lbs. This excludes any variation from the above list (para 73).

76. Given that Pel-Air now requires an allowance for fuel usage for taxi and for approach, this reduces the amount of fuel remaining to below FFR, and therefore the aircraft is unsuitable for the task.

Conclusion

ATSB

77. The ATSB report on page viii states
"… an investigation report must include factual material of sufficient weight to support the analysis and findings."

78. This submission identifies significant errors in the ATSB report of this accident.

79. As is apparent from the analysis above, the ATSB report contains insufficient factual material to support its analysis and findings. Therefore, the veracity of the ATSB report is questionable.

CASA

80. There is a duality of responsibility shared between the operating crew and the aircraft operator; for the crew operates within an environment of which the operator dictates aspects and limitations through their imposition and

implementation of risk controls, the quality of which arise from the oversight of the regulator (CASA) through its approval process.

81. Specifically, the ATSB report (page 25) recognizes that in regard to steps taken to ensure sufficient fuel and oil is carried;
"An operator also shared that responsibility, and was required by CAR 220 to include specific guidance for the computation of the fuel carried …"

82. The quality of risk controls are fundamentally determined by their adequacy and reliability.

83. In the events and conditions associated with this accident it is apparent the risk controls were inadequate and unreliable. This in turn identifies a lack of effective regulatory oversight of the operator by CASA.

General

84. The purpose of this submission is to improve aviation safety in Australia, by demanding the highest quality of standards and practices by both the regulator and the independent investigative body.

85. The standards and practices exhibited by both ATSB and CASA in this matter I have observed several times previously, and in my experience seem to be indicative of their general standards.

86. I support the sentiment of the submission of Mr Bryan Aherne.

I would like to thank the Committee for the opportunity to present this submission.

Report completed by:

Richard James Davies

10 October 2012