



FINAL REPORT

AIC 20 - 2005

PNG Air Limited

P2 - ATB

ATR 72 - 212A 600

Inflight engine fire warning indication

Mt Hagen Airport, Western Highlands Province

Papua New Guinea

23 December 2020

About the AIC

The Accident Investigation Commission (AIC) is an independent statutory agency within Papua New Guinea (PNG). The AIC is governed by a Commission and is entirely separate from the judiciary, transport regulators, policy makers and service providers. The AIC's function is to improve safety and public confidence in the aviation mode of transport through excellence in: independent investigation of aviation accidents and other safety occurrences within the aviation system; safety data recording and analysis; and fostering safety awareness, knowledge and action.

The AIC is responsible for investigating accidents and other transport safety matters involving civil aviation in PNG, as well as participating in overseas investigations involving PNG registered aircraft. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The AIC performs its functions in accordance with the provisions of the *PNG Civil Aviation Act 2000 (As Amended)*, and the *Commissions of Inquiry Act 1951*, and in accordance with *Annex 13* to the *Convention on International Civil Aviation*.

The objective of a safety investigation is to identify and reduce safety and operational related risk. AIC investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not a function of the AIC to apportion blame or determine liability. At the same time, an investigation report must include relevant factual material of sufficient weight to support the analysis and findings. At all times the AIC endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why it happened, in a fair and unbiased manner.

About this report

On 23 December 2020, at about 15:44 local time (05:44 UTC), the AIC was notified via a phone call by the Operator, PNG Air Limited and shortly after by NiuSky Pacific Limited via email about an inflight fire warning on Engine No. 2 (right-hand) of an ATR 72 – 212A 600 aircraft, registered P2-ATB. The AIC immediately commenced a serious incident investigation.

This *Final Report* has been produced by the PNG AIC pursuant to *ICAO Annex 13* and has been approved for public release.

The report is based on the investigation carried out by the AIC under the Papua New Guinea *Civil Aviation Act 2000 (As Amended)*, and *Annex 13* to the *Convention on International Civil Aviation*. It contains factual information, analysis of that information, findings and contributing (causal) factors, other factors, safety actions and safety recommendations.

Although AIC investigations explore the areas surrounding an occurrence, emphasis is placed on those facts that are relevant to understanding how and why the accident occurred are included in the report. The report may also contain other non-contributing factors which have been identified as safety deficiencies for the purpose of improving safety.

Readers are advised that in accordance with *Annex 13 to the Convention on International Civil Aviation*, it is not the purpose of an AIC aircraft accident investigation to apportion blame or liability. The sole objective of the investigation and the final report is the prevention of accidents and incidents (Reference: *ICAO Annex 13, Chapter 3, paragraph 3.1*). Consequently, AIC reports are confined to matters of safety significance and may be misleading if used for any other purpose.



Capt. Aria Boufaga, MBE

Acting Chief Commissioner

6 June 2022

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1 FACTUAL INFORMATION

1.1 Occurrence Details

On 23 December 2020, at 13:52 local (03:52 UTC¹), an ATR 72-212A 600 aircraft, registered P2-ATB, owned by MSN 1317 Leasing Limited, and operated by PNG Air Limited was on a scheduled passenger IFR² flight from Kiunga Airport, Western Province to Mt Hagen Airport, Western Highlands Province, when the crew received an Engine No. 2 (right-hand) inflight fire warning alert.



Figure 1: P2-ATB depiction of flight path.

The Pilot in Command (PIC) was the pilot flying while the co-pilot was the pilot monitoring. There were 61 persons on board the aircraft; two pilots, two cabin crew and 57 passengers.

According to the flight plan (See 4.3 Appendix C), the estimated time of departure from Kiunga was 11:20, on a direct track to Mt. Hagen with a cruising altitude of 17,000ft AMSL³.

The recorded data⁴ showed that the aircraft departed Kiunga at 12:54, about one and half hour behind schedule. At 13:21, the aircraft was established at the nominated cruise altitude of 17,000 ft and tracked Northeast to Mt. Hagen.

Enroute to the destination, the flight crew discussed the delay. They subsequently advised the passengers via the public address (PA) of the delay which was due to offloading additional passengers as the flight was overbooked.

¹ The 24-hour clock, in Coordinated Universal Time (UTC), is used in this report to describe the local time as specific events occurred. Local time in the area of the serious incident, Papua New Guinea Time (Pacific/Port Moresby Time) is UTC + 10 hours.

² Instrument Flight Rule

³ Above Mean Sea Level. All altitude data obtained from the Flight Data Recorder recorded data are referenced to Mt Hagen Airport elevation of 5,386 ft

⁴ The recorded data is comprised of the Flight Data Recorder (FDR) and the Cockpit Voice Recorder (CVR).

According to recorded data, at 13:40, about 36 nm from Mt. Hagen Airport, the aircraft commenced its descent from 17,000 ft and the crew subsequently carried out the *Descent* checklist and completed the checklist a minute later.

The recorded data showed that the aircraft stopped descending at 16,400 ft, the lower safe altitude (LSALT) for the area⁵, about 31 nm from Mt. Hagen Airport. The crew stated that they levelled off at the LSALT because they were still in Instrument Meteorological Conditions (IMC). During this time, the crew carried out and completed the *Approach* checklist.

At 13:46, about 13 nm Northwest of the aerodrome, the crew initiated the *Before Landing* procedures. They set the power levers to flight idle position and flap to 15°. As they established visual reference with the aerodrome, about 12 nm out, they extended the landing gear, set flap 30° and began descending again. The initial descent rate established was about 1,800 fpm with airspeed of 130 kts.

At 13:48, about 10 nm from the aerodrome, while passing through 15,600 ft AMSL the propellers were set to 100% override. The descent rate increased to about 3,000 fpm at 14,500 ft AMSL while maintaining an airspeed of about 130 kt.

Passing 13,000 ft (about 7,600 ft AGL⁶), 7 nm from the aerodrome, the aircraft turned right and joined left downwind for runway 30. The descent rate reduced to an average of about 2,400 fpm on the downwind leg. The autopilot was disengaged midway through downwind. The crew received clearance from Hagen Tower to land.

As the aircraft passed 6,200 ft (1,800 ft AGL), the descent rate reduced further to below 2,000 fpm.

At 13:52:31, about 2 nm south of runway 30, while initiating the turn onto left base, the Master Warning (MW) and fire warning⁷ alarm activated. Upon observing this warning, the crew immediately began their diagnosis while continuing the base turn.

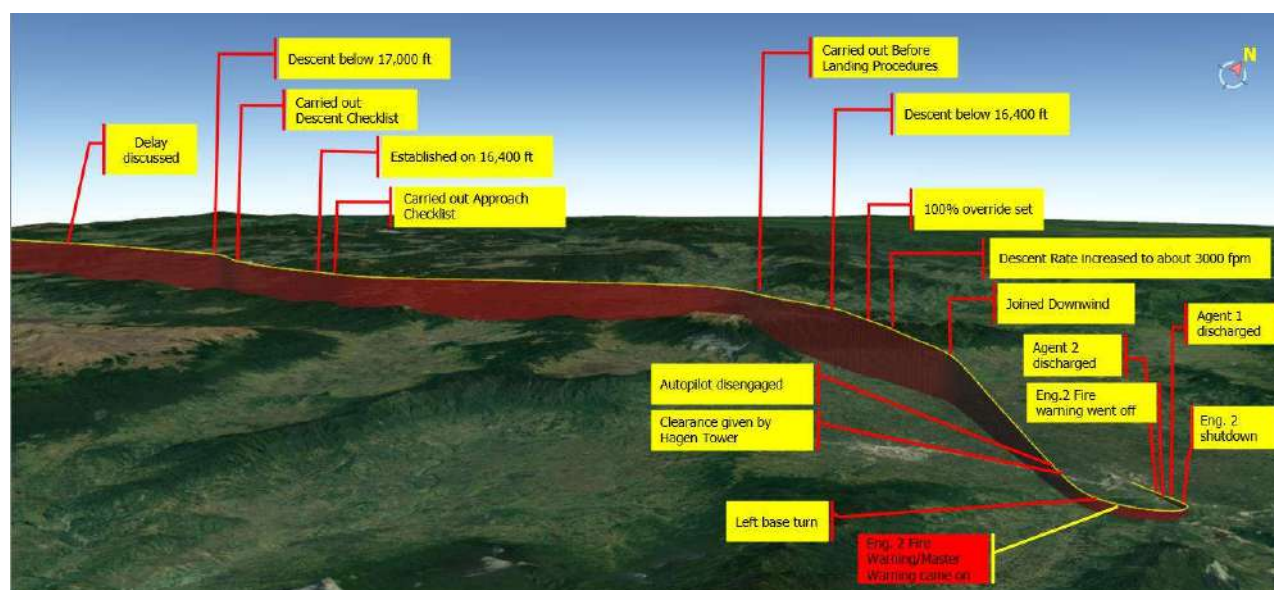


Figure 2: P2-ATB flight path with significant events.

5 Lower Safe Altitude for route Dauli-Hagen

6 Above ground level

7 The fire warning indicating fire from Engine No.2

The crew confirmed that the warnings were associated with Engine No. 2. They subsequently proceeded with the Engine No. 2 *ENG (2) Fire or Severe Mechanical Damage in flight procedure (See 4.4 Appendix D)*. As the aircraft turned onto the final approach path, the crew shut down Engine No.2.

While establishing on final approach, the crew pulled the respective Fire Handle for Engine No.2 and subsequently discharged the extinguishing agent No.1 while passing 500 ft AGL. According to the recorded data, as the aircraft was passing through 100ft, the fire warning went off. About 25 seconds later the crew discharged agent No. 2, completing the procedure. The crew stated during interview that they had to discharge agent No.2 because the Fire Handle remained illuminated.

The crew continued on the final approach in the single engine configuration and landed at 13:54:08.

According to the recorded data, while the aircraft was vacating via taxiway Alpha, the Master Warning and the Nacelle Overheat (NAC OVHT) warning for Engine No. 2 activated.

The aircraft continued taxiing through Alpha to the parking bay adjacent to the Hagen Tower building and the Airport Rescue Fire Fighting (ARFF) base.

At 13:57:56, as the aircraft came to a stop, the flight crew instructed one of the cabin crew member to look out through the windows on the right side and check if there was any indication of fire from the Engine No. 2. The cabin crew member checked and reported back that there was no indication of fire. The flight crew subsequently shut down Engine No.1 and instructed the cabin crew to carry out a normal disembarkation. According to the cabin crew a normal disembarkation was conducted.

At 13:59, the flight crew notified Hagen Tower that they had received an inflight engine fire warning indication and also requested for the ARFF to inspect Engine No. 2. ARFF proceeded to the aircraft to inspect the engine. Following their inspection, they informed the crew that there was no indication of fire or smoke evident.

No injuries or damage to the aircraft were reported as a result of the occurrence. At the time of the emergency, there was no conflicting traffic in the area.



Figure 3: Derived ground track of P2-ATB after touchdown with significant events.

1.2 The Aircraft

1.2.1 Airworthiness and Serviceability

For aircraft details, refer to *4.1 Appendix A*.

The airworthiness and maintenance records were reviewed during the investigation and the following were observed:

- Aircraft Certificate of Airworthiness (CoA) was current.
- Aircraft Annual Review (AAR) was current.
- Maintenance Log entries showed that there was;
 - no outstanding scheduled maintenance.
 - no outstanding defects identified.
 - no MEL⁸ items pending.

The aircraft was airworthy and serviceable at the time of the in-flight emergency event flight.

1.2.2 Engines

For aircraft details, refer to *4.1 Appendix A*.

1.2.2.1 Engine No.2 maintenance records

The investigation reviewed the maintenance history of the Engine No.2 for the period prior to the occurrence date and found no outstanding maintenance, Furthermore, there was no record of a similar condition that had been recorded in the technical maintenance logbook.

1.2.2.2 Inspection – AIC Investigators

On 24 December 2020, AIC investigators carried out a visual inspection on the Engine No. 2 at Mt. Hagen Airport. The investigators were unable to observe any evidence of fire.

1.2.2.3 Engine Fire Protection System

The Fire Protection System of the Engine consists of the following:

- two identical sensing element loops (A and B) mounted in parallel
- fire detection control unit
- two fixed extinguisher bottles

The engine fire warning alert is activated basing on the temperature change experienced by the sensing element loops; when the sensing element loops in the engine sense an increase in temperature (>240°C and >250°C)⁹, reduction in resistance and increase in capacitance of the sensing elements.

The Fire Detection Control Unit (FDCU) processes the warning signals from the sensing element loops and indicates the corresponding engine fire warning in the cockpit on the ENG FIRE panel.

⁸ Minimum Equipment List

⁹ The operate temperature tolerance is $\pm 28^{\circ}\text{C}$

If there is only variation in resistance with no accompanying variation in capacitance, the FDCU will indicate in the cockpit on the ENG FIRE panel as a *FAULT* signal of the corresponding sensing element loop.

According to the *ATR 72- 212A 600 Fleet QRH Emergency Procedure, Engine 1 (2) Fire or Severe Mechanical Damage in Flight* procedure, upon an ENG 1 or ENG 2 FIRE warning indication on the ENG FIRE panel, the flight crew are to pull the engine fire handle. This will result in the illumination of the ‘SQUIB’ *legend*¹⁰ on corresponding ‘AGENT 1’ or ‘AGENT 2’ pushbutton switch. The illuminated ‘SQUIB’ pushbutton switch for corresponding agent is then selected, enabling the discharge of the corresponding extinguisher bottle. The amber ‘DISCH’ *legend*¹¹ comes on when the corresponding bottle has been discharged.

The extinguisher bottles may be used for either Engine No.1 or Engine No.2. They are located on each side of the fuselage. Once the extinguisher bottles are discharged, the extinguishing agent (freon or halon) is then dispensed to the appropriate engine through the pressurized extinguisher system line.

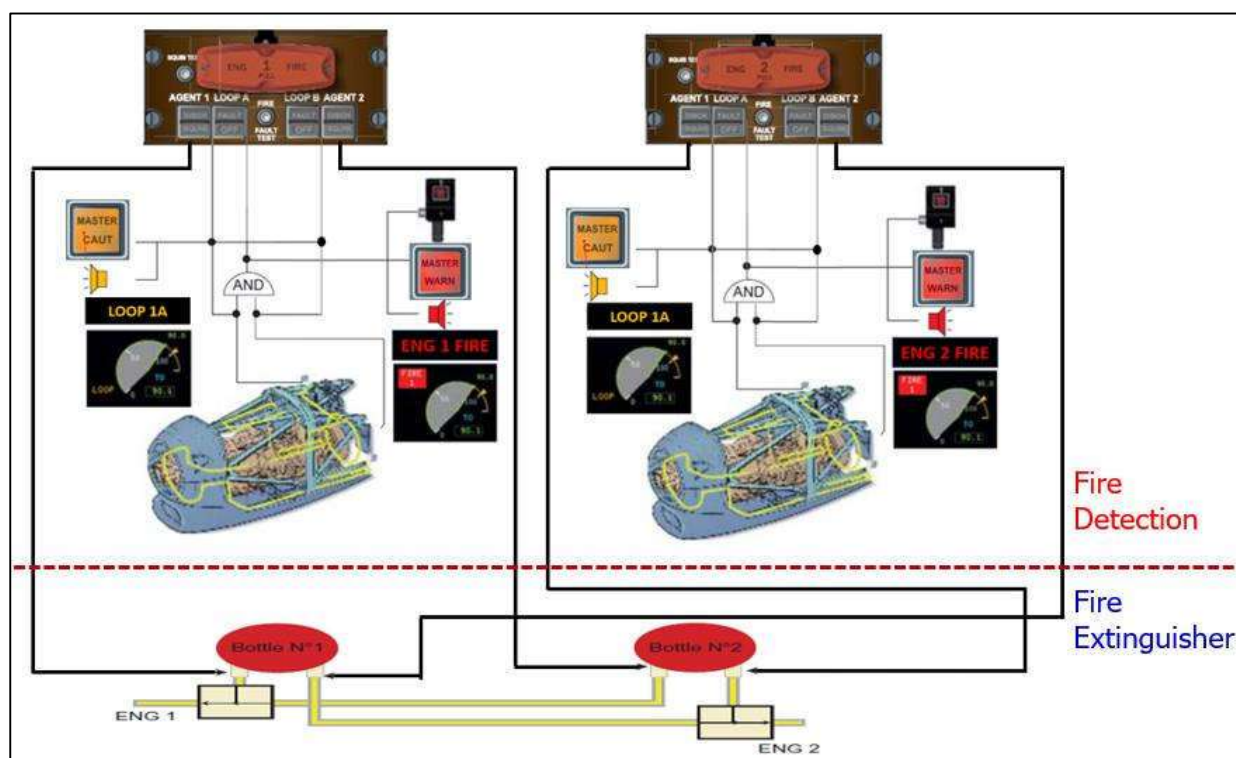


Figure 4: Schematic of the Fire Protection System in the Engine.

1.2.2.4 Flight Warning System

The Flight Warning System (FWS) draws crew’s attention when a failure is detected and guides the crew to the affected system. During the ENG 2 Fire Warning inflight, the following warning systems were visually displayed in the cockpit.

¹⁰ Illuminated SQUIB legend indicates that the squibs at the discharge valve of the fire extinguisher are charged and ready to be discharged

¹¹ Discharged

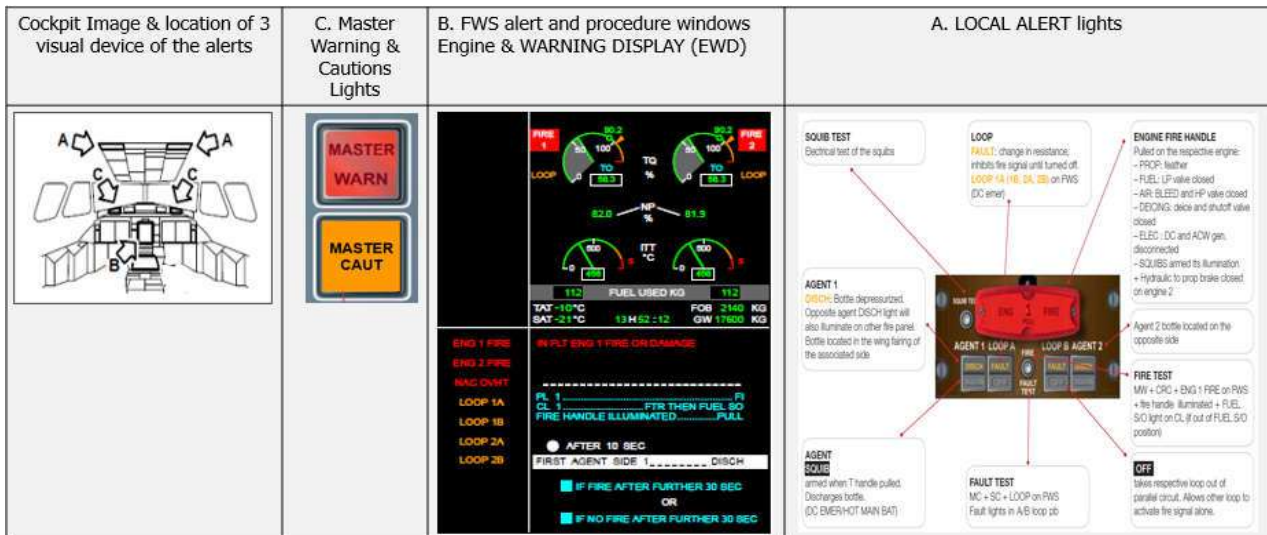


Figure 5: Three types (A, B and C) of visual devices.

1.2.2.4.1 Engine Warning Display Alerts associated to the Fire Protection System in the Engine

The warning and caution messages associated with the Fire Protection of the Engine are displayed on the Engine Warning Display (EWD) as shown below:

EWD Message	Level	CAUSE
ENG 1 FIRE / ENG 2 FIRE	Warning	Engine fire detected
NAC OVHT	Warning	RH NAC OVHT >170°C and aircraft is on ground
LOOP 1A / LOOP 1B / LOOP 2A / LOOP 2B	Caution	Engine fire loop fault

Table 1: Fire protection alerts of the Engine and associated causes.

The engine fire warning (spurious alarm) referred to in aircraft manufacturer’s disseminated Operational Engineering Bulletin, OEB N°32, contained in an ‘All Operators Message’ (AOM), dated 17 October 2017 is identical to a warning observed when an actual engine fire is sustained. There are no distinguishing features in the warning system itself. However, for the false alarm is likely to occur when the aircraft meets specific criteria listed in the OEB, i.e., the aircraft is in a steep descent, configured for landing with the power lever at flight idle (see 4.5 Appendix E).

1.3 Pilot Information

1.3.1 PIC

1.3.1.1 Qualifications

The personal records of the PIC showed the following qualifications:

- PNG Airline Transport Pilot License (Aeroplane) initially issued on 29 July 2005.
- Medical class one (1) was current at the time of the occurrence with medical limitation (Multi crew).
- Endorsed on Single Engine Aeroplane (Land): <5700 Kg MTOW, Multi-Engine Aeroplane (Land): DHC6, E100, BE3B, DHC7, F28, DHC8, ATR 42/72.

Refer to 4.1 Appendix A, Crew Details for further information about the PIC.

The training and competency records of the PIC showed that he was appropriately trained and competent at the time of the occurrence. His *Emergency Procedures* (EP) training for ATR 72-600 Series aircraft type was current at the time of the occurrence. Date of EP training revalidation was 27 March 2020 and expiry date was 27 May 2021.

1.3.2 Co-pilot

1.3.2.1 Qualifications

The personal records of the co-pilot showed the following qualifications:

- PNG Commercial Pilot License (Aeroplane) issued on 21 August 2019
- Medical class one (1) was current at the time of the occurrence with medical limitation (Spectacles).
- Endorsed on the Single Engine Aeroplane (Land); C152; C172 and Multi-Engine Aeroplane (Land); PA 44, ATR 42/72 (Co-pilot)

Refer to *4.1 Appendix A Crew Details*, for further information about the co-pilot.

According to the training and competency records, the co-pilot was appropriately trained and competent at the time of the occurrence. The *Emergency Procedures* Training for ATR 72-600 Series aircraft type was current at the time of the occurrence. Date of EP training revalidation was 15 October 2020 and had expiry date of 11 December 2021.

The co-pilot reported that she was wearing her spectacles at the time of the occurrence.

1.4 Meteorological Conditions

Refer to *4.2 Appendix B*.

1.5 Flight Recorders

The aircraft was fitted with a Solid-State Cockpit Voice Recorder (SSCVR) and a separate Solid-State Flight Data Recorder (SSFDR). Table below provides more information of the recorders.

CVR		FDR	
Manufacturer	L3 Communications	Manufacturer	L3 Communications
Model	FA2100	Model	FA2100
Part number	2100 – 1020 - 02	Part number	2100 – 4045 - 00
Recording Duration	At least 2 hours	Recording Duration	More than 25 hours
Recording Capability	4 Channels Channel 1-Captain, Channel 2-First Officer Channel 3- PA Channel 4- CAM	Recording Capability	1024 sample per seconds
		ATR Calibration File	V4

Table 2: Flight Recorders technical information.

Data from both recorders were downloaded by AIC on-site, and a readout was later carried out at the AIC Flight Recorder Facility.

1.5.1 Engine Parameters

There were significant information or parameters of the engine recorded by the FDR. The engine parameters recorded by the FDR were plotted and analysed by AIC to see if there were any abnormalities during the time before, during, and after the warnings were activated (refer Figure 6). According to the FDR readout, the investigation observed no abnormal engine parameters.

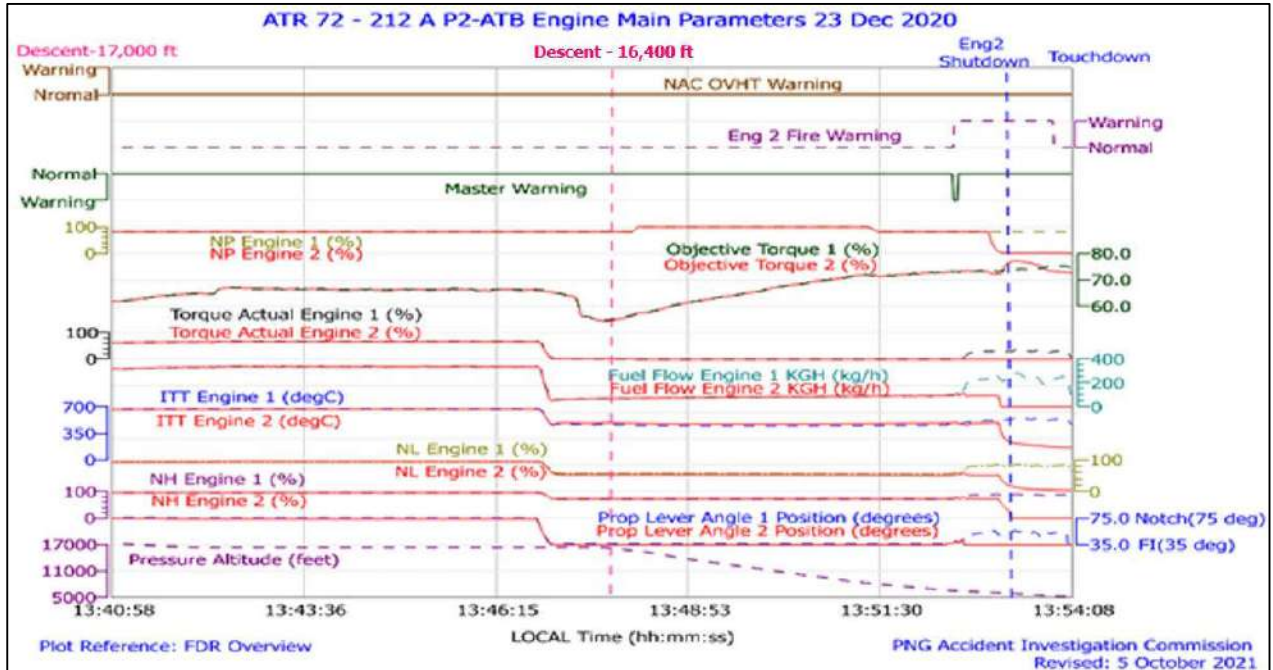


Figure 6: P2-ATB Engine Parameters readout

1.5.2 Cruise, Descent & Landing Configuration

The relevant FDR recorded data, and derived/calculated parameters were plotted to depict the cruise, descent and landing phases of the occurrence as shown in the Figure 7 below.

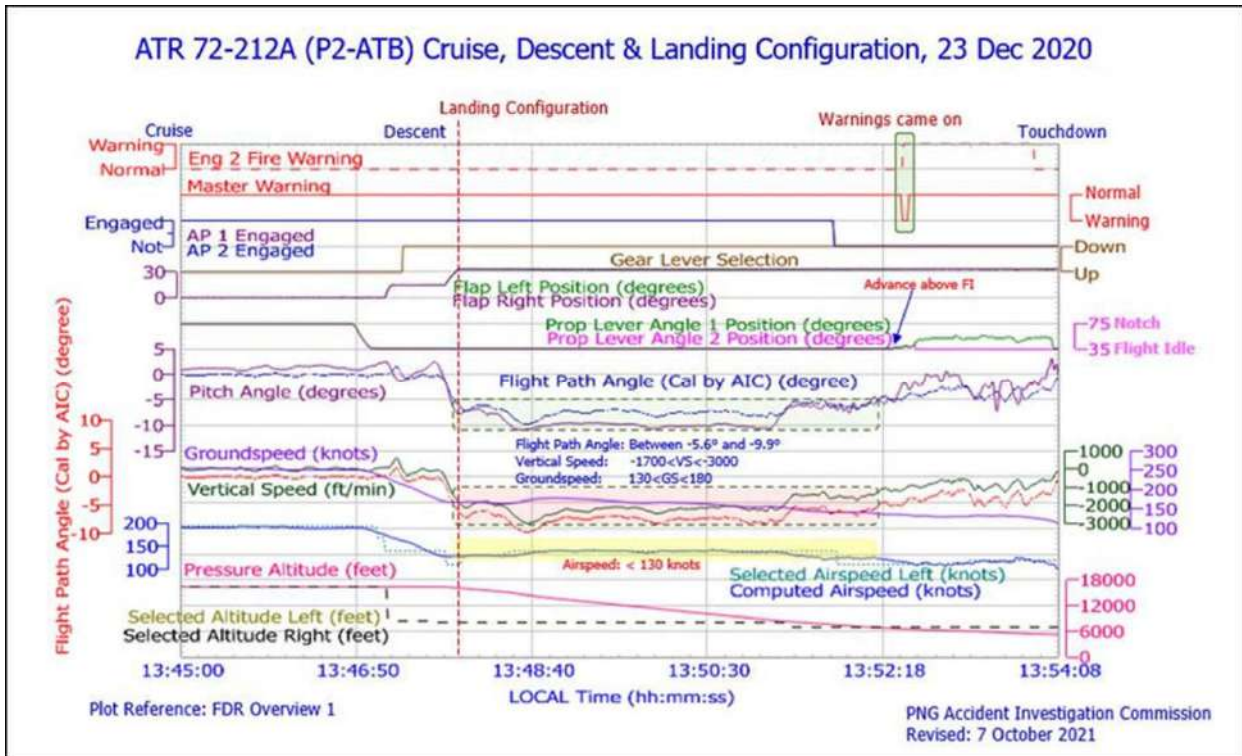


Figure 7: P2-ATB cruise, descent and landing phases of the occurrence flight.

1.5.3 FPA Envelope

A plot was generated by AIC with vertical speed (ft/min) on the vertical axis and the groundspeed (m/s) on the horizontal axis to identify when the Flight Path Angle (FPA) went beyond -5.5° during this occurrence flight after landing configuration. From the plot shown in Figure 8, an envelope was identified consisting of upper and lower bounds of the vertical speed and groundspeed, generating FPA to go beyond -5.5° .

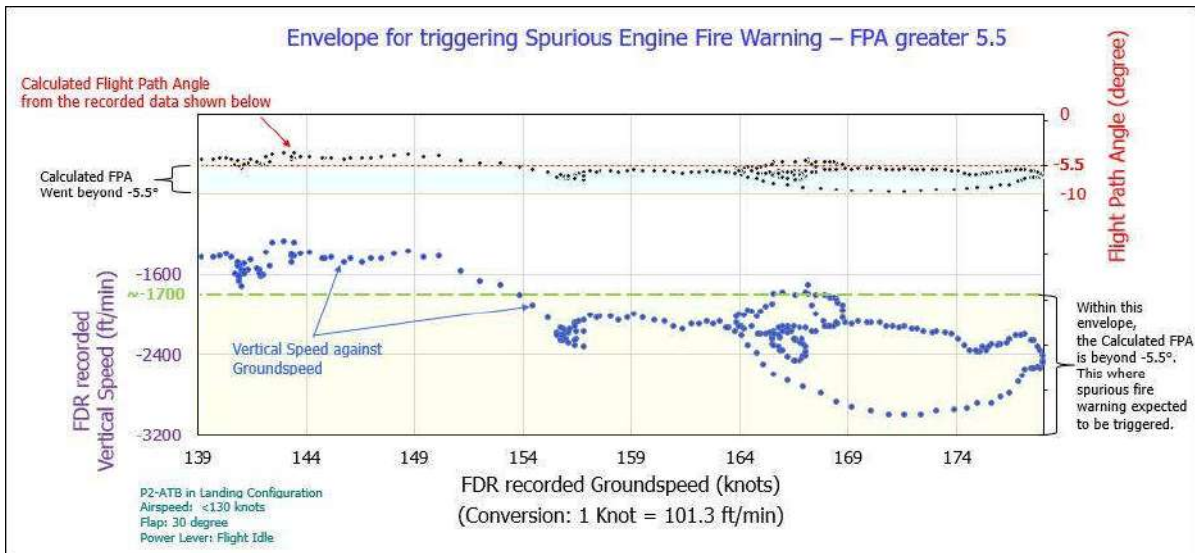


Figure 8: FPA greater than 5.5° envelope.

1.5.4 Calculated stable approach profile against P2-ATB actual approach profile.

The recorded FDR data was also used to derive and plot an estimate stable approach profile of 3° slope to compare against the actual approach profile which was conducted during the occurrence flight as shown in Figure 9 below.

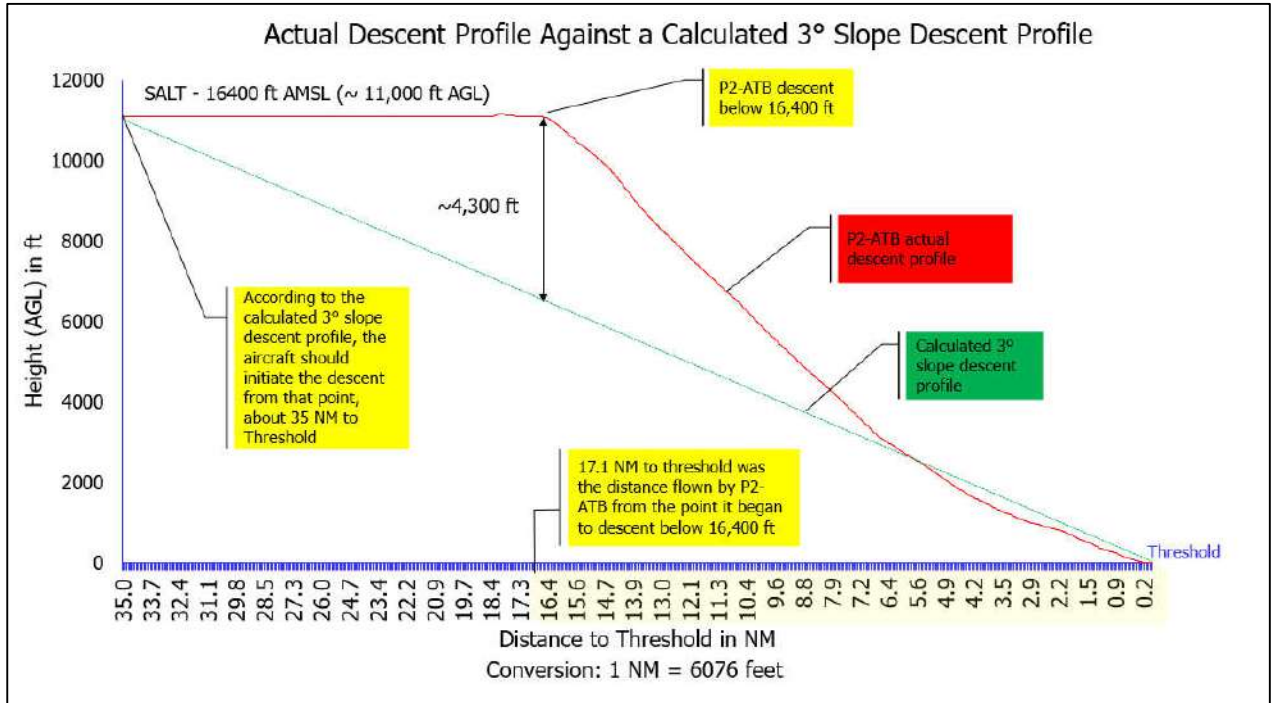


Figure 9: Calculated stable descent profile against the actual approach profile of P2-ATB.

1.6 Organisational information

1.6.1 Manufacturer - ATR

ATR is a Franco-Italian aircraft manufacturer headquartered on the grounds of Toulouse Blagnac International Airport in Blagnac, France. It was formed during 1981 as a joint venture between Aérospatiale of France (now Airbus) and Aeritalia (now Leonardo) of Italy. The company's principal products are the ATR 42 and ATR 72 aircraft, of which it has developed multiple variants of both types.

1.6.1.1 ATR's All Operators Message (AOM)

An *All Operators Message* (AOM) is a means of informing the operators of matters, which are, at the time of its release, either under investigation or dealt with by ATR. However, operators may consider initiating their own actions.

On 27 October 2017, ATR issued an AOM *Ref AOM 42/72/2017/07 issue 1*, to inform and provide operators, including PNG Air with operational recommendations in relation to an Operational Engineering Bulletin N°32 (OEB N°32) following inflight events of spurious Engine Fire Warning.

See 4.5 Appendix E: OEB N°32.

1.6.1.1.1 Operator's dissemination process

The Operator's *119/Vol 1 Flight Operations Policy and Procedures Manual, Section 1.3.2 Flight Standing Orders (FSO)* states that Flight Operations Management staff may approve and authorise FSO to notify staff on temporary and/or revised procedures to the company Exposition (manuals).

According to email records provided to the AIC by the Operator, the disseminated AOM Ref *AOM 42/72/2017/07 issue 1* was received by the Operator on 1 November 2017, from the Manufacturer. However, there was no evidence of a Notice to Air Crew (NOTAC) through a FSO facilitated by the Flight Operations Management informing the flight crew of the OEB N°32 procedures. According to the Operator's internal safety investigation report, it was found that the failure to disseminate the FSO, in relation to OEB 32, was due to cooperate managerial changes in 2018 which affected functions responsible for the review of OEB.

1.6.2 ATR's QRH Procedures

According to the ATR's QRH Revision 10.1 dated July 2020, adopted by the Operator and current at the time of the occurrence, there are two different procedures for Inflight Engine Fire Warning as follows:

- ENG 1 (2) Fire or Severe Mechanical Damage in flight
- OEB 32 Engine Fire Warning

See 4.4 Appendix D: *Emergency Procedures: Eng 1 (2) Fire or Severe Mechanical Damage Inflight* and 4.6 Appendix F: *OEB N°32 Procedure* in ATR QRH.

According to the interview, the flight crew stated that they applied *ENG (1/2) Fire or Severe Mechanical Damage In Flight*. Further investigation into this procedure found that the flight crew were not considering applying the OEB N°32 as they were not familiar with it.

1.6.3 Aircraft Operator: PNG Air Limited

PNG Air Limited is an airline company based at Jacksons International Airport, Port Moresby, Papua New Guinea. The company has an Air Operator Certificate (AOC) issued pursuant to *Section 47 (3) and 49 of the Civil Aviation Act 2000 (as amended) and Part 119.9* and is authorised to perform commercial air operations in accordance with its exposition and *Parts 121/125*.

It operates scheduled domestic and international flights, as well as contract corporate charter work. PNG Air Limited is also authorised to maintain and release to service aircraft and aircraft components as defined in the organisation's exposition.

1.6.4 Operator's Standard Instrument Approach

The Operator's *119/Vol 1 Flight Operations Policy and Procedures Manual (FOPPM), Section 6.23.1 'Mandatory Instrument Approach Procedures'* states;

All company operations at the following ports are MANDATORY to conduct the CA Rule Part 95 published Instrument approach procedure:

<i>AYMH¹²</i>	<i>AYTA</i>	<i>AYTB</i>	<i>AYXM</i>	<i>AYMR</i>
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The Operator's Flying Operations Route and Aerodrome Guide for Mt Hagen Airport also states;

¹² IATA four letter code for Mt Hagen Airport

Flights inbound from other than GUGPU¹³ may join the RNAV/GNSS¹⁴ at either YMHEA or YMHEB in order to ensure a stabilised approach is conducted into AYMH.

According to the Operator's *119/Vol 6C ATR 72 212A 600 Performance Manual*, flights inbound from other than GUGPU are expected to join the RNAV/GNSS at either YMHEA or YMHEB in order to ensure a stabilized approach is conducted into Mt Hagen.

Variation from this procedure is only permitted in conditions of VMC¹⁵ – minimum in flight visibility of 8 km and minimum cloud base at AYMH of less than broken at 3,000 ft AGL.

For a visual approach, the Operator's *FOPPM Section 6.24 Visual Approaches*, states that company operations only permit visual approach to be conducted in visual conditions by day only.

The aircraft may be maneuvered visually clear of terrain provided the crew can be certain that there is no compromise in safety for the continuation of the approach.

Within 30 nm of that aerodrome at an altitude not below the safety altitude for that route segment, the appropriate DME/GPS step of the arrival procedure, or the MDA for the procedure being flown, that aircraft is established:

- *clear of cloud;*
- *in sight of ground or water;*
- *with a flight visibility not less than 5,000m; and*
- *can subsequently maintain the above at not less than the minimum visibility required for VFR flight (AIP¹⁶ ENR 1.5), to within the circling area.*

However, aircraft shall not descend below 1000 ft. above the field elevation until intercepting an approach path, which conforms with the nominal 3-degree slope that is 320'/nm).

P2-ATB complied with the above prior to the steep descent in VMC to join left downwind for runway 30.

According to the weather information in *4.2 Appendix B*, this variation was also applicable to the occurrence flight.

1.6.5 Flight Crew Simulator Training

The Operator's *119/Vol 3 Flying Operations Training and Competency Manual, Section 7.9.3 'ATR72-212 600 Recurrent Flight Training'* states.

Recurrent flight training is provided on a six-monthly basis and is conducted in an approved Full Flight Simulator. This training is provided as part of the six-monthly 2-day Simulator cyclic exercise. Recurrent flight training is provided on Day 1 in the form of Line Oriented Flight Training and Operational Competency Training (LOFT/OCA).

The flight crew stated in an interview with the AIC that the Simulator Training was conducted every 6 months, however, due to COVID 19 pandemic, Simulator trainings at the approved simulator centres were cancelled. Appendix A of the Operator's *119/Vol 3 Flying Operations Training and Competency Manual* states;

The International Pandemic (Covid-19) created international travel bans therefore access to Aircraft simulators around the world became restricted.

As part of CASA PNG internal risk assessment processes, *CASA Instrument number 20/EXE/01* dated 3rd April 2020, allowed for the use of an extended Route and Aerodrome Proficiency Check to meet the

13 GUGPU, YMHEA and YMHEB are five letter waypoints

14 Area Navigation/ Global Navigation Satellite System

15 Visual Meteorological Condition

16 PNG Aeronautical Information Publication

Operational Competency Assessment Program requirements listed in *CAR 121.607*, in the absence of the six-monthly 2-day simulator cyclic exercise.

In order to comply with CASA PNG's requirements, the Operator established the following:

- DH8A – Covid -19 Operational Competency Assessment Program for 2020 Version 1.0 Issued 19 May 2020.
- ATR72-212A (600 Series) – Covid-19 Operational Competency Assessment Program for 2020 Version 1.0 Issued 14 May 2020.

1.7 Additional Information

1.7.1 Post-occurrence engine inspection

1.7.1.1 Inspection – Flight Crew

The flight crew stated in their interview that they did a post flight inspection on the Engine No. 2 nacelle for any evidence of fire but there was no evidence found.

Post maintenance records and statement provided to the AIC by the Operator showed that there were no defects identified by the engineers to indicate an engine fire. According to post maintenance records, the engine was found to be serviceable and released back to service.

2 AIC COMMENT

2.1 General

The investigation determined that the aircraft did not sustain an Engine No.2 fire. The Operator's post occurrence maintenance records and statements also confirmed that there were no defects identified by their engineers to indicate an engine fire. The engine was found to be serviceable, and the aircraft was released back to service.

The engine fire warning and alarm observed by the crew on the day was, instead, an undue alarm. The investigation confirmed that the false alarm activation was a result of the aircraft being on a steep descent, in the landing configuration with power at flight idle. These were the flight condition criteria specified by the Manufacturer as conducive to an engine fire warning. The nacelle ventilation reduced causing the nacelle temperature to increase. When the temperature increased and reached the engine fire warning specifications, the fire warning alarm was triggered.

2.2 Operations

When the crew reached the lower safe altitude (LSALT), they levelled off due to Instrument Meteorological Conditions and continued tracking at that altitude towards aerodrome. By the time the crew established visual reference, 12 nm from the aerodrome they resumed descent and the aircraft was about over 4,000 ft higher than the altitude it would have been at based on a 3° slope descent from the 36 nm point.

The investigation learned that due to being high when visual reference with the runway was made 12 nm, the crew extended flap, configured the aircraft for landing, set power to flight idle, and propeller pitch to full fine. The crew confirmed that the early configuration was to be able to lose altitude within a short distance.

The investigation determined that options were available at Mt. Hagen including but not limited to communicating with Tower to track to the holding point YMHEA or conduct a visual orbit to lose height on track to avoid placing the aircraft in an undesirable state of a steep descent profile. Nevertheless, the investigation's discussion on these options does not condemn the option taken by the flight crew.

The manufacturer of the aircraft was aware of engine fire warnings being triggered without an actual engine fire on the ATR Model. The Manufacturer had disseminated an AOM dated 27 October 2017, to all operators of the ATR 72 and 42 series, referring to the OEB N°32 to provide awareness and recommend a procedure for initial diagnosis of an engine fire warning received while in a specific in-flight condition. The investigation found that the information was not provided to the Operator's pilots by the Operator.

The OEB was also incorporated into the QRH published in July 2020. The Operator had received the QRH which was in use for operation. However, awareness of the OEB to the Operator's pilots was not provided.

The crew actions and discussions in-flight showed that they did not have awareness of any sort of the manufacturer's OEB information. For this reason, the crew's decision making, and actions could not consider the OEB procedures at the on-set of the emergency.

The Investigation determined that had the awareness of the OEB N°32 to the pilots been made, this would have enhanced their situational awareness to specified inflight condition that would contribute to the potential triggering of a spurious engine fire warning as described in OEB N°32.

2.3 Organisational

2.3.1 Operator

2.3.1.1 Dissemination of OEB N°32

The investigation found that the OEB N°32 was issued to the Operator's designated email address and person on 1 November 2017 by the Manufacturer. However, the investigation determined that no internal disseminations or awareness of the OEB was conducted by the Operator upon receipt of the OEB to the time of occurrence. Furthermore, following the incorporation of the OEB by update of the QRH, the crew were still unaware of the potential for a spurious engine fire warning in the specified conditions.

The investigation determined that as a minimum, awareness about issues identified and disseminated by the Manufacturer and the dissemination of these issues to intended personnel within the Operator should be considered.

The investigation also determined that as there was no evidence of an official dissemination of OEB N°32 to the flight crew, the investigation could not establish if the OEB N°32 procedures were mandatory to be actioned by the flight crew.

3 SAFETY RECOMMENDATION

Recommendation number AIC 22-R04/20-2005 to PNG Air Limited

The PNG Accident Investigation Commission recommends that PNG Air Limited should ensure that OEB 32 including all OEBs that have a significant operational and safety impact on the operation of their aircraft, are appropriately captured, processed, and disseminated to the affected personnel.

4 APPENDICES

4.1 Appendix A: Table containing additional information of the report

General Details			
Date and time		23 December 2020, 13:52 local (03:52 UTC)	
Occurrence category		Serious Incident	
Primary occurrence type		Inflight fire warning indication	
Location		Mt Hagen Airport, Western Highlands Province	
Type of Operation, Passenger information and damage details			
Type of Operation		Scheduled passenger flight	
Persons on board		Flight crew: 2 (PIC and co-pilot) Cabin crew: 2	Passengers: 57
Injuries		Crew: Nil	Passengers: Nil
Damage		There was no damage sustained by the aircraft	
Other Damage		Not applicable.	
Fire		There was no evidence of pre- or post-impact fire.	
Crew Details			
PIC		Co-pilot	
Gender	Male	Gender	Female
Age	49	Age	23
Nationality	Papua New Guinean	Nationality	Papua New Guinean
Licence type	ATPL	Licence type	CPL
Total hours	12,747 hours	Total hours	835.60 hours
Total hours in Command	10,913 hours	Total hours in command	Not Applicable
Total hours on type	1165 hours	Total hours on type	578 hours
Total last 365 days	716 hours	Total last 365 days	516 hours
Total hours last 30 days	86.3 hours	Total hours last 30 days	59.7 hours
Total last 14 days	72.9 hours	Total hours last 14 days	48.8 hours
Total hours last 7 days	24.3 hours	Total hours last 7 days	13.5 hours
Aircraft Details			
Aircraft Manufacturer		ATR (Avions de Transport Régional)	
Aircraft Model		72-212A	
Serial Number		1317	
Year of manufacture		2016	
Total hours since new		8,049.8	
Total cycles since new		8,131	
Certificate of Registration (CoR)		Issued: 12 April 2016	Expires: Non-Terminating
Certificate of Airworthiness		Issued: 12 April 2016	Expires: Non-Terminating
Engine 1		Engine 2	
Manufacturer	Pratt & Whitney	Manufacturer	Pratt & Whitney
Model	PT6A	Model	PT6A
Type	PT6A-27	Type	PT6A-27
Serial number	PCE-50926	Serial number	PCE-50926
Total time since new	23,591.6	Total time since new	15,412
Total cycle since new	36,328	Total cycle since new	19,276
Propeller Data			
Propeller manufacturer		Hamilton Sundstrand Aerospace, Division of Hamilton Sundstrand Corp.	
Propeller model		568F-1	
Propeller part number		815500-3	
Serial number		Left: FR20151123	Right: FR20151124
Total time (h) since new		Left: 8,049.8	Right: 8,049
Cycles since new		Left: 8,131	Right: 8,131
Aerodrome information			
Name of Aerodrome		Mount Hagen Airport	
Location indicator		AYMH	
Latitude		05° 49' 40.1" S	
Longitude		144° 17' 58.3" E	
Elevation		5,386 ft	
Runways		RWY 12	RWY 30
		RWY 08	RWY 26
		Slope of RWY 0.2 % Down to SE	
		Slope of RWY 0.2 % Down to SE	
RFFS Category		Category Six (6)	
Apron Surface and strength		MAIN APN SEALED, PCN 30, GA APN SEALED MAX 5,700KG	


4.2 Appendix B: Meteorological Information

Meteorological Information	
The Terminal Aerodrome Forecast (TAF) for Mt Hagen was issued at 23:05UTC on 23 December 2021 and was valid from 02:00UTC to 11:00UTC.	
Between 02:00 11:00 the forecasted weather was as follows:	
Source	PNG National Weather Services
Forecast type	Aerodrome Forecast for Major Ports
Issued	09:30, 23 December 2020
Validity	12:00-21:00, 23 December 2020
Wind	Variable winds at 3 kt
Visibility	Greater than 10 km with light showers and rain
Rain	Reduced showers and rain
Cloud	At 1,000 ft – scattered clouds At 1,700 ft – broken clouds
Inter	Thirty-minute fuel holding was forecasted between 04:00 and 11:00 with visibility of 4000 m in heavy showers and broken clouds at 800 ft
QNH	1016 hPa, 1014 hPa and 1015 hPa
Intermediate weather validity	14:00-21:00, 23 December 2020
Visibility	4000 m
Rain	Heavy showers and rain
Cloud	At 800 ft – broken clouds
Actual Weather	
Source	Hagen Tower Recording
Time	13:43:21, 23 December 2020
Wind	Winds blowing at 260° at 15 kt
Visibility	Ok
Cloud	Scattered clouds in the field
QNH	1015 hPa
Temperature	26°C
PIC observation	During interview with AIC, the PIC stated that by the time they were visual, the PIC observed that the south east of the aerodrome was clear of scattered clouds.

4.3 Appendix C: P2-ATB Occurrence Flight Plan

AKI/ARW FLT NR: 28409 UNITS: AG/ARW/PT/AT	DATE: 30/1/20 SCHED. DEP: 120 ARR: RBS	VERSION: 02/02/2003 CAPT: [REDACTED]																																																																																																																																																							
<p>AKI PASO TOC DNLI TOO ITRNO ARW</p> <p>ALCRAFT: ARW FL SPEED: 170 CLIMB/DESC: 15000/17000 FUEL FACTOR = 1.00 AIR COND. = NORMAL ISA+17 ATMOSPHERIC COND. = NORMAL</p>																																																																																																																																																									
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4.4 Appendix D: Emergency Procedures: Eng 1 (2) Fire or Severe Mechanical Damage in Flight.

 PNG Air CG / 75	EMERGENCY	PRO NNO Page n°01
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ALL	
ENG 1(2) FIRE OR SEVERE MECHANICAL DAMAGE IN FLIGHT	
E70.02	

<ul style="list-style-type: none"> ▶ PL (affected ENG)..... FI ▶ CL (affected ENG)..... FTR THEN FUEL S.O. ▶ FIRE HANDLE (affected ENG)..... PULL ■ If fire persists after 10 s <ul style="list-style-type: none"> ▶ AGENT 1 (affected ENG)..... DISCH ■ If fire persists after 30 s <ul style="list-style-type: none"> ▶ AGENT 2 (affected ENG)..... DISCH ▶ LAND ASAP ▶ ATC..... NOTIFY ▶ ENG (affected) : DO NOT RESTART ▶ SINGLE ENG OPERATION procedure (A70.12) APPLY

4.5 Appendix E: OEB N°32

ATR ATR 42/72 F.C.O.M.	OPERATIONS ENGINEERING BULLETINS O.E.B. N° 32	3.12	
		P 1	
		Issued by EV	OCT 17

SUBJECT: ENG FIRE warning during steep slope descent in landing configuration with Power Levers at Flight Idle.

1- Reason for issue

This OEB is issued to inform and provide operators with operational recommendations following in-service events of spurious ENG FIRE warnings that occurred in the following conditions:

- During steep slope descent at low speed (around 130 kt to final approach speed),
- In landing configuration (Gear Down, Flaps 30 or 35) set at high altitude,
- Power Levers durably maintained at Flight Idle.

In such conditions, the nacelle ventilation is reduced and the nacelle temperature may reach the engine fire detection threshold triggering the ENG FIRE warning.

In some of these in-service events associated with the above conditions, the ENG FIRE warning stopped when the Power Levers were advanced above Flight Idle position.

2- ATR action

Investigations are in progress to define the appropriate corrective actions.

3- Operational recommendations

ATR recommends to plan and to perform a standard 3° to 5° descent flight path from top of descent, in clean configuration, IAS 240 kt.

If for any reason, during the final descent in landing configuration, the power levers have to be set in flight idle this shall be for temporary flight path corrections only.

In addition, ATR reminds that stated spurious ENG FIRE warning is associated with temperature increase in the nacelle with no evidence of fire. However, any ENG FIRE warning, even temporary, must be reported to operator's maintenance in order to conduct the appropriate nacelle inspections and subsequent maintenance actions if required.

4- Procedure in case of ENG FIRE warning, in landing configuration, with PL at FI

Following procedure has to be applied only in the following conditions:

- During steep slope descent at low speed (around 130 kt to final approach speed), and
- In landing configuration (Gear Down, Flaps 30 or 35) set at high altitude, and
- Power Levers durably maintained at Flight Idle.

■ If ENG 1(2) FIRE warning during steep slope descent in landing configuration with PL at FI

- ▶ PL 1+2 ADJUST ABOVE 10% TQ
TQ increase improves the nacelle ventilation

■ If ENG 1(2) FIRE warning stops before 10 s

- ▶ PL 1+2: MAINTAIN ABOVE 10% TQ
LAND ASAP

■ If ENG 1(2) FIRE warning persists after 10 s


- ▶ ENG 1(2) FIRE OR SEVERE MECHANICAL DAMAGE IN FLIGHT procedure.....APPLY

- ▶ Report to maintenance

Nacelles must be inspected in accordance with the appropriate maintenance procedures.

Validity: All aircraft

4.6 Appendix F: OEB N°32 Procedure in ATR QRH

 CG / 75	OPERATIONS ENGINEERING BULLETINS OEB 32	OEB 32/1 Page n°08	
ENGINE FIRE Warning			
_991cad58-ad82-43cb-97a9-097088b275a6		4.1	
ALL			
Procedure			
Procedure in case of ENG FIRE warning, in landing configuration, with PL at FI			
Following procedure has to be applied only in the following conditions:			
<ul style="list-style-type: none"> - During steep slope descent at low speed (around 130 kt to final approach speed), and - In landing configuration (Gear Down, Flaps 30 or 35) set at high altitude, and - Power Levers durably maintained at Flight Idle. 			
■ If ENG 1(2) FIRE warning during steep slope descent in landing configuration with PL at FI			
<ul style="list-style-type: none"> ▶ PL 1+2ADJUST ABOVE 10% TQ TQ increase improves the nacelle ventilation 			
■ If ENG 1(2) FIRE warning stops before 10 s			
<ul style="list-style-type: none"> ▶ PL 1+2 MAINTAIN ABOVE 10% TQ LAND ASAP 			
■ If ENG 1(2) FIRE warning persists after 10 s			
<ul style="list-style-type: none"> ▶ ENG 1(2) FIRE OR SEVERE MECHANICAL DAMAGE IN FLIGHT procedure..... APPLY 			
<ul style="list-style-type: none"> ▶ MAINTENANCE REPORT..... PERFORM 			
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;"> Note <i>Nacelles must be inspected in accordance with the appropriate maintenance procedures.</i> </td> </tr> </table>			Note <i>Nacelles must be inspected in accordance with the appropriate maintenance procedures.</i>
Note <i>Nacelles must be inspected in accordance with the appropriate maintenance procedures.</i>			
END OF OEB 32			

4.7 Appendix G: Approved Approach Plate for Mt Hagen

