Australian Government

Australian Transport Safety Bureau

Engine flameouts on descent involving GIE Avions De Transport Regional ATR72-212A, VH-FVN

near Canberra Airport, Canberra, ACT, on 13 December 2018

ATSB Transport Safety Report
Aviation Occurrence Investigation
AO-2018-081
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Addendum

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Safety summary

What happened

On 13 December 2018, a GIE Avions De Transport Regional ATR72-212A registered VH-FVN was operated by Virgin Australia Airlines on a scheduled passenger flight from Sydney to Canberra. The aircraft encountered icing, turbulence and rain associated with thunderstorm activity in the area, so the crew diverted and held as required in order to avoid the adverse weather. Shortly after commencing descent into Canberra, passing 11,000 ft, the No.2 engine flamed out. The engine's automatic ignition system engaged and the engine recovered within five seconds without pilot input. Approximately one minute later, passing 10,000 ft, the No.1 engine flamed out and automatically recovered within five seconds, again without pilot input.

Because of the quick nature of the automatic recovery, the crew did not action any checklists. The crew selected manual ignition as a preventative measure and continued to Canberra without further incident.

What the ATSB found

The ATSB found no evidence to suggest a mechanical fault or failure caused the engines to flameout and that the flameouts were likely to have been caused by the environmental conditions during the flight, most likely either icing or moderate/heavy rain, or a combination of both.

Aircraft systems and procedures for protection and recovery from flameouts in these conditions were reliable and effective in relighting the engines. However, the decision to select manual ignition following the flameouts potentially reduced the recovery and protection of the engines in the event of any potential further flameout.

What's been done as a result

The operator has conducted an internal investigation, released internal communications for awareness of the occurrence and ensured its pilots are aware of the appropriate use of manual ignition.

The manufacturer is ensuring all operators of the ATR72-212A are aware of the appropriate use of manual ignition. They are also reviewing operational documentation as to whether this requirement could be explicitly included.

Safety message

An engine flameout event is not common in today's modern turbo propeller engines, but it is still possible. Reliable and effective systems and procedures exist to protect and recover from such events and it is important that pilots follow manufacturer procedures for these systems. In the case of the ATR72-212A, the automatic ignition system worked as designed, correctly identifying the loss of engine power, initiating ignition and successfully relighting the engines without pilot input. The selection of manual ignition potentially reduces the recovery mechanism effectiveness against flameouts, and should only be used when directed by checklist or a minimum equipment list.

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The occurrence

On 13 December 2018, a GIE Avions De Transport Regional (ATR) ATR72-212A 600 series (ATR72), registered VH-FVN, was operated by Virgin Australia Airlines (Virgin) on scheduled passenger flight VA660 from Sydney, New South Wales (NSW) to Canberra, Australian Capital Territory (ACT). Two pilots, two cabin crew and 42 passengers were on board. The captain was the pilot monitoring (PM) and the first officer (FO) was pilot flying (PF).

During planning for the flight, the crew were aware of significant weather en route, with a line of thunderstorms approaching Canberra. A second line of thunderstorms was approaching and the crew assessed that the aircraft would arrive in Canberra at about the same time as the second line of storms. Sufficient fuel was loaded to enable the duration of the flight to Canberra, to hold for one hour, return to Sydney and hold for another hour.

Following departure at about 1741, the crew were able to observe the weather ahead and formulated plans to avoid the storms. About 10 minutes after departure, the crew requested a diversion 5 NM left of track to avoid weather. About 15 minutes after departure, air traffic control (ATC) cleared the aircraft to climb to flight level 160 (FL160[1]) and to increase their diversion left of track up to 10 NM.

Shortly thereafter, the clearance to divert left of track was cancelled by ATC and the crew were requested to provide a heading which would keep them clear of weather. ATC then directed the aircraft to maintain FL130 due to passing traffic, later clearing a further climb to FL140.

After being cleared for the standard arrival route (STAR) BUNGO 3A into Canberra, the crew accepted direct tracking to waypoint HIPPO. En route to HIPPO, the aircraft entered visible moisture with a total air temperature (TAT) below 7 °C, which were icing conditions as defined by the aircraft manufacturer (ATR). The crew acknowledged this and turned on anti-icing systems in accordance with the aircraft procedure for entering such conditions.

The crew requested an update on the weather at Canberra. ATC advised there was significant showers in the area with greatly reduced visibility. The crew commenced descent in accordance with their arrival clearance and ATC directed them to stop descent at FL120. ATC asked the crew if they would like to attempt an approach but the crew elected to hold at HIPPO at FL120 until the weather passed. Shortly thereafter, icing was visible on the aircraft and the crew selected de-icing systems ON as required by ATR FCOM procedures.

After holding at HIPPO for about 7 minutes, the crew requested to track south then west to fly around the weather and then back to Canberra. ATC cleared the aircraft to do so with headings at crew discretion.

The aircraft tracked south until about 1830 when it turned back north, allowing the crew to assess the weather at Canberra (utilising radar). The crew decide to track to waypoint POLLI for the POLLI 7 STAR and advised ATC accordingly. ATC advised the crew that a STAR clearance was available, but the crew advised ATC to standby as they were busy avoiding weather. Shortly after, ATC advised that an approach was now viable (a previous aircraft had landed) but the crew continued to POLLI and assessed the weather for themselves.

The crew elected to hold at POLLI and held there until about 1849 when ATC vectored them to the north to commence the STAR. At 1853, the aircraft was cleared by ATC to resume its own navigation direct to waypoint HUNNI, descend to 9,000 ft to commence the STAR.

At about 1854, shortly after descent had commenced, the aircraft passed FL110 with both power levers close to flight idle when No.2 engine lost power and flamed out. The master warning and ENG 2 OUT annunciators displayed, and No.2 engine torque reduced to zero. In the time it took

[1] Flight level: at altitudes above 10,000 ft in Australia, an aircraft's height above mean sea level is referred to as a flight level (FL). FL 370 equates to 37,000 ft.

the crew to acknowledge the warning and confirm what it was, No.2 engine self-recovered, torque returned to normal and the warnings ceased. The crew discussed that they likely encountered icing, confirmed engine power had returned to normal and confirmed that anti-icing and de-icing systems were on. Due to the automatic recovery, the crew were not required to action any checklist or procedures associated with an engine flameout in flight.

At about 1855, both power levers were at flight idle when No.1 engine lost power and flamed out. The master warning and ENG 1 OUT annunciators displayed, and No.1 engine torque reduced to zero. In the same way that No.2 engine had recovered, No.1 engine self-recovered by the time the crew had acknowledged and confirmed the flameout. Again, no checklist or associated procedures were required to be actioned.

The captain immediately identified the de-ice mode selector switch in order to ensure the de-ice cycle was in 'fast'; however, the captain inadvertently selected the slow cycle. The captain then selected ignition to 'manual', in order to provide continuous ignition in an attempt to prevent any further flameouts.

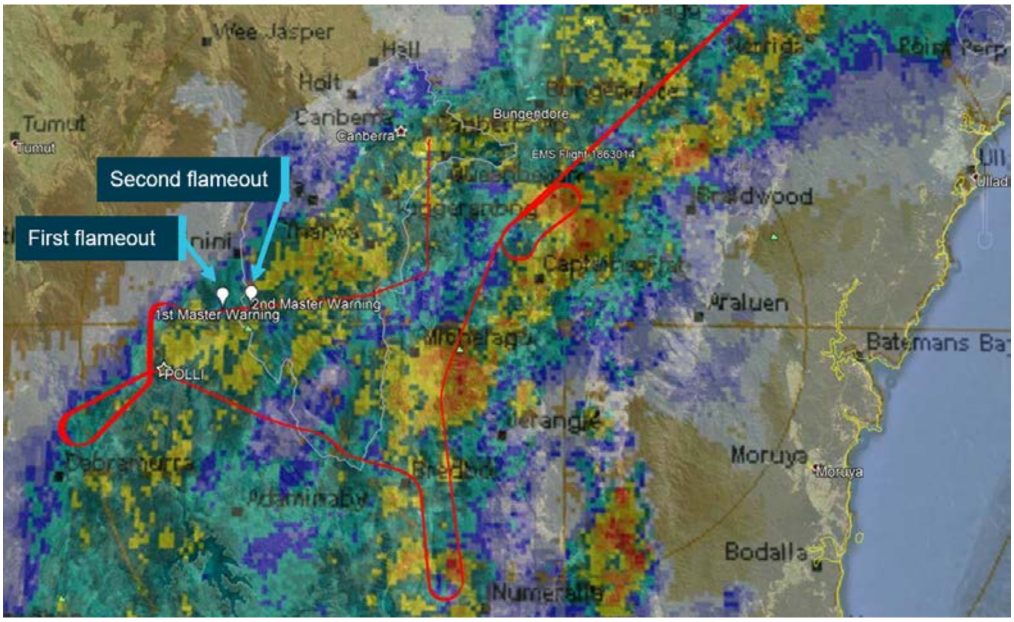
Satisfied that power in both engines had been restored to normal, the crew discussed the situation, but were unable to determine the cause of the flameouts. They confirmed manual ignition ON, icing protection ON and observed that the temperature was 12 degrees, prompting further discussion on the use of icing protection. The crew decided that they would not turn any of the icing protection systems off at that stage and would fly at icing speeds[2] if they needed to keep the icing protection on for landing.

The crew stated that the aircraft was in heavy rain at the time of the flameouts but they did not notice any significant icing at the time. Figure 1 depicts the rainfall recorded by radar at about the time of the first flameout.

The crew continued the approach, and at about 1901, the crew confirmed the aircraft was no longer in icing conditions and selected the de-icing OFF but left the anti-icing systems ON.

No further flameouts occurred and the aircraft landed at 1906.

Figure 1: Radar image at time of flameouts



The radar image at 1854, about the time of the first flameout. Areas of yellow depict moderate rainfall with red depicting heavy rainfall. Source: PWC annotated by ATSB.

2 Icing speeds are minimum manoeuvre speeds in icing conditions that must be flown in order to provide sufficient margin against aerodynamic stall.

Context

Pilot Information

Captain

The captain commenced flying the ATR72 with Virgin in 2013 as a first officer, becoming a captain in April 2018. At the time of the incident, the captain had accumulated 204 hours command on the ATR72. The captain had a total flying time of 6,660 hours with 2,225 hours on ATR72.

Previous flying experience included charter and regular public transport (RPT) operations on aircraft including the Embraer 120 and Cessna 441 (Conquest). The captain had also undertaken flying instructor roles prior to that.

The captain's most recent line and simulator check records did not highlight any major or ongoing proficiency concerns. Engine malfunctions and adverse weather operations were included in those assessments.

First officer

The first officer (FO) commenced flying the ATR72 with Virgin in 2012 as a first officer. At the time of the incident, the FO had a total flying time of 6,700 hours, with over 3,000 hours on the ATR72.

Previous flying experience included charter and RPT and flying instruction.

The FO's most recent line and simulator checks did not note any major or ongoing proficiency concerns. Engine malfunctions and adverse weather operations were included.

Aircraft Information

General

VH-FVN was an ATR72-212A 600 series aircraft manufactured in 2012. The aircraft is a twin-engine turboprop regional airliner that seats up to 78 passengers (dependant on configuration) and is crewed by two pilots and two cabin crew.

Engine combustion and flameout

The ATR72 is powered by two Pratt & Whitney Canada (PWC) PW127M turbo propeller engines. The engine operates by continuous internal combustion of a fuel air mix. A flameout is an unintentional extinguishing of the flame in the engine. This may result from interruption of any of the requirements for sustaining combustion, being fuel, air and heat.

The ATR *Flight Crew Operating Manual* (FCOM) provided information on possible causes of a flameout. Pilots were able to use this to assist in identification of the likely cause in the event of a flameout and to allow appropriate action to take place. The FCOM stated:

> The causes of engine flameout can generally be divided into two categories:
>
> - External causes such as icing, very heavy turbulence, fuel mismanagement. These causes, which can affect both engines can generally be easily determined and an immediate relight can be attempted.
> - Internal causes such as engine stalls or failures, usually affect a single engine. These causes are not so easily determined. In these cases, the engine is shut down then the cause of the flameout investigated. If the cause of the flameout cannot be determined, the need for engine restart should be evaluated against the risk of further engine damage or fire that may result from a restart attempt.

'Icing' is not quantified. However, another section of the FCOM stated that very large ice accretion on the engine intake may generate an engine flameout when the ice breaks free. Rain is not specifically included in the FCOM as an external cause of flameouts.

Fuel system

Fuel management and fuel quality was considered as a possible external contributor. There was no evidence to suggest fuel mismanagement and inspection of the fuel system did not identify any contaminants. Fuel management and fuel quality were not considered contributory to the flameouts.

Ignition system

The PW127M engine has a high-energy ignition system which provides for engine start on ground or in flight. Following a successful engine start, the ignition system is automatically disengaged and no longer providing a spark as combustion is self-sustaining. Under control of the electronic engine control (EEC) unit, the ignition system will activate if NH[3] drops below 60 per cent.

A guarded manual ignition switch is available to allow the crew to manually select continuous ignition. The FCOM referred to manual ignition in situations where an EEC is OFF (fault or malfunction). If one or both EECs are OFF, manual ignition is required for flight in the following cases: icing conditions, engine(s) flame out, emergency descent, severe turbulence and heavy rain, or when operating on a contaminated runway for take-off or landing.

The ATSB noted that there was no FCOM reference that prohibited the use of manual ignition in other situations and there was no explicit direction for ignition to remain in its automatic initiation state.

Prior to the engine flameouts on VH-FVN, the ignition system was in its normal state, being OFF, but primed to be initiated by the EEC as previously described. For both flameouts, the ignition system automatically engaged as designed and successfully relit the engines. Following the automatic recovery, the crew reported that they selected manual ignition as a safety measure to prevent further flameouts. The crew could not recall any specific guidance from ATR for flights in heavy weather.

Following notification of the occurrence, ATR advised Virgin that selection of manual ignition was not appropriate and that use of manual ignition other than as directed lowered the flameout recovery and protection afforded by automatic ignition. ATR explained the difference as follows:

> On ATR72-600, each engine is equipped with a high-energy ignition system. Triggering of auto-relight energizes igniter boxes, which deliver sparking rate of 5/6 per sec for 25s.
>
> MAN IGN [manual ignition] is a guarded push button at overhead panel and is to be used in case of EEC Fault or under dispatch minimum equipment list (MEL[4]) with EEC OFF as per ATR procedures.
>
> When selecting MAN IGN, ignition system is activated at a sparking rate of 5/6 per sec for 25s. Then, the sparking rate becomes slower after 25s (changing from 5/6 per sec to 1 per sec).

ATR later clarified their explanation for automatic ignition in that following the initial 25 seconds, the sparking rate also reduces to one spark per second.

The implication is that if manual ignition has been ON for more than 25 seconds at the time of a flameout, it would be steady at one spark per second and not at the high spark rate of automatic ignition, therefore potentially delaying the relight process.

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[3] NH: the rotational speed of the high pressure compressor in the turbo propeller engine.

[4] MEL: a minimum equipment list of items of equipment that may be temporarily inoperative under certain conditions and limitations, while still maintaining the level of safety intended in the design standards.

Icing and rain protection system

The ATR72-600 is fitted with various protection systems for operations in various environmental conditions, particularly icing.

The system consists of:

- Ice detector, mounted on left wing which electronically monitors ice accretion.
- Ice evidence probe (IEP) near captain's windshield for visible detection of ice accretion.
- Electrically heating (anti-ice) of propeller blades, windshields, probes and flight control horns.
- Pneumatic boots (de-ice) on wing and horizontal tailplane leading edges and engine air intakes and gas paths.
- Windshield wipers for rain removal from front windshields.

An aircraft performance monitoring system works in conjunction with the above components, through alerts to the crew if an aircraft aerodynamic performance degradation is detected due to ice accretion.

The aircraft engines are protected from icing through the de-ice system controlled via two push button switches, one for each engine. Pneumatic boots, located in the engine air intakes and gas paths, inflate on an automatically controlled cycle to dislodge ice accretions.

The selection of engine de-ice is not a recorded parameter. However, it is monitored for faults and any faults triggered are recorded. No engine de-icing faults were recorded for the incident flight. There was no indication of any problems with the engine de-icing system that may have contributed to the flameouts. Similarly, there was no damage to the engine intakes which may indicate impact due to large ice accretions having broken away during the de-ice process.

Water ingestion margin testing

The PW127M engines had been tested and certified for water ingestion requirements, and in addition to this, another water ingestion test was undertaken by PWC in 2016 to identify engine capability in terms of water ingestion. This was on one PW127M engine mounted on a test bed with a non-bypass intake duct. This configuration tested a worst case scenario with all water entering the engine.

The test concluded that the engine demonstrated significant margin over the certification requirements and a resilience to adverse operational environments. The certification required the engine to maintain steady operation with an ingestion of water at a 4 per cent water to air ratio (WAR). The test engine performed such that a power loss and flameout occurred at 15.8 per cent WAR.

Procedures

Operations in adverse atmospheric conditions

Volume A1 of Virgin's operations manual suite included a section on adverse atmospheric conditions. Requirements for avoiding thunderstorms and severe weather as well as specific sections on lightning, cyclones and volcanic ash were included. Rain was not specifically mentioned.

The ATR FCOM also provided guidance and procedures for operations in adverse weather conditions. There were several sections with procedural guidance on icing conditions and turbulence and general adverse weather.

Rain was not afforded any specific guidance in the FCOM nor was it mentioned, except with regard to the use of windshield wipers and in the EEC fault procedure.

During the flight, the crew diverted and held as required to maintain the aircraft clear of the weather. On several occasions, the crew requested diversion off track to maintain safe separation from the approaching weather and entered a holding pattern on two occasions to allow for passage of thunderstorms over Canberra. The flight was initially flown at turbulence speed[5] due to moderate the turbulence encountered. From about 1807, the aircraft was flown at icing speeds. Although turbulence continued for the remainder of the flight, icing speeds were flown from that point as the crew assessed that icing was a higher threat than the moderate turbulence.

Engine flameout recovery procedure

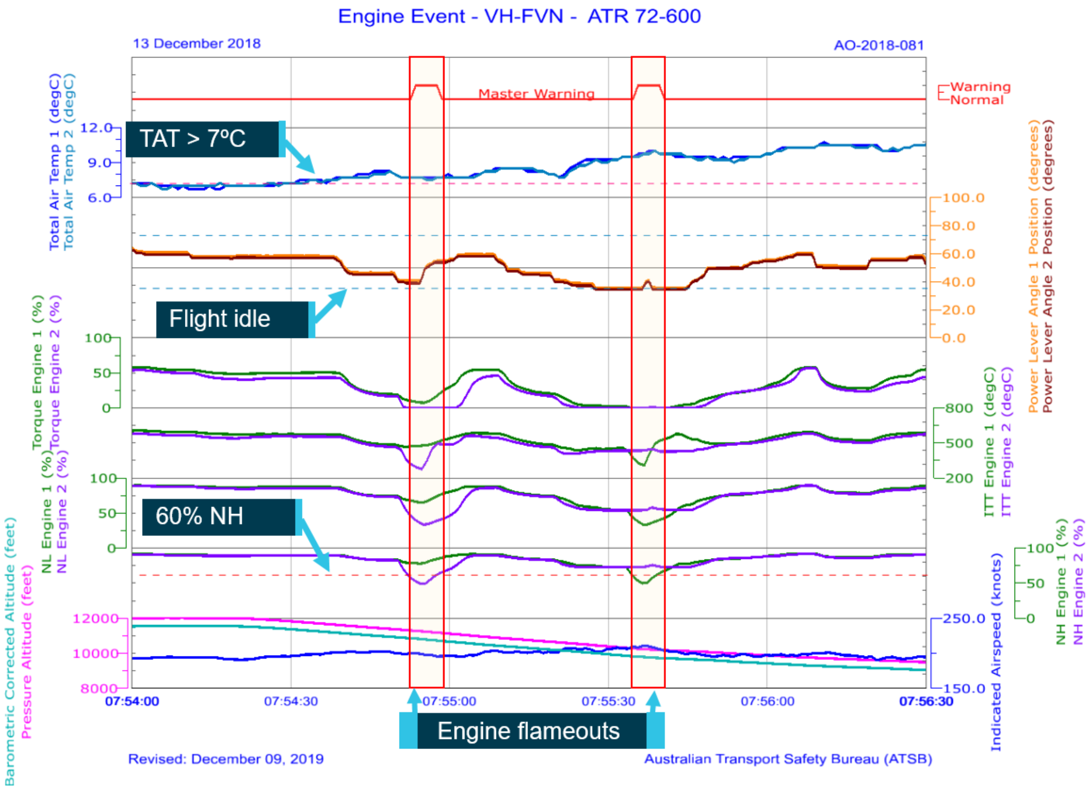
An engine flameout procedure was included in the aircraft operational documentation. The initial actions for an engine flameout is to move the power lever on the affected engine to flight idle. If NH drops below 30 per cent (no immediate relight) then the engine is to be shutdown.

For this incident, upon warnings being displayed for the first flameout, the crew acknowledged the master warning and whilst assessing the situation, the engine power restored prior to any action being required. The second flameout occurred in a similar manner and engine power restored whilst the crew were assessing the situation. No checklist procedures were carried out given the timeframe from flameout to automatic recovery.

Recorded flight data

The ATSB downloaded and analysed the data from the aircraft flight data recorder. Figure 2 below presents the key recorded aircraft and engine parameters at the time of the flameouts. During both flameouts, the master warning was active for 5 seconds. This included the time from flameout, initiation of automatic ignition and full recovery.

Figure 2: Recorded flight data



Source: ATSB

5 Turbulence speed is a maximum speed for turbulent conditions in order to provide the best protection against the effect of gust on the aircraft structural limits.

Weather information

Weather forecasts provided to the crew included significant meteorological information (SIGMET), forecasting squall line thunderstorms with hail, with tops up to FL400. The weather was forecasted to move to the east-south-east at 15 knots. At the time of planning, operational dispatch notes indicated this weather was within 50 NM to the west of Canberra. A significant weather (SIGWX) chart covering FL100-FL250 forecast moderate turbulence between FL100-FL250 and moderate icing from FL120-FL240 with isolated embedded cumulonimbus clouds.

The Bureau of Meteorology (BOM) graphical area forecast, covering mean sea level to 10,000 ft, indicated a broad area of thunderstorms including reduced visibility down to 2,000 m associated with heavy rain and areas of 4,000 m visibility associated with widespread rain. BOM always assume that severe icing is coincident with the convective activity of forecast thunderstorms and therefore do not forecast icing separately.

The aerodrome forecast (TAF) for Canberra, issued at 1608 and valid from 1700 until 1700 the next day, forecast temporary deterioration periods where thunderstorms, reduced visibility, rain and hail would occur, broadly consistent with the area forecasts and significant weather charts. However, the prevailing conditions at Canberra suggested an approach and landing would be achieved in between the temporary deteriorations.

The crew were well aware of the expected weather for the flight and in conjunction with Virgin operation staff, sufficient fuel was loaded to allow the crew to hold and/or divert as required in order to allow for passage of the weather. Both crew commented that at no stage did they consider that the flight should be cancelled due to the weather.

BOM radar imagery around the time of the incident shows lines of moderate rainfall, which the BOM describe as indicative of thunderstorm activity.

Special observations at Canberra from 1800 confirmed thunderstorm activity and continued to be reported at Canberra until 1900.

The crew observed the actual weather was as expected but commented that turbulence was the prevalent issue. The crew described the turbulence as moderate throughout the flight with a highest recorded G load[6] of +1.76. Icing conditions were encountered, with the crew observing visible moisture and total air temperature (TAT) below 7 °C. Ice accretion was observed shortly thereafter.

The crew recalled that rain was heavier in the POLLI area. The captain described being in heavy rain at the time of the flameouts although BOM radar imager indicates moderate rain at the time. Ice was not evident on the IEP at that time and the captain recalled that the windscreen looked like ‘a bucket of water had been thrown on it’. Consistent with their pre-flight assessment that they could fly, the crew noted that the weather, although significant, was not anything that they had not encountered previously.

Post occurrence maintenance inspection

Following the occurrence, a number of maintenance inspections were undertaken. The inspections that took place included:

- Visual inspection of the inlet compressor blades and exhaust outlet (a detailed inspection of the engine core was not undertaken as the visual inspection of outer section did not identify any damage indicative of ingesting foreign objects. This was based on ATR/PWC guidance).
- Chip detector inspection.
- Severe turbulence inspection.

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[6] G load: the nominal value for acceleration. In flight, G load represent the combined effects of flight manoeuvring loads and turbulence and can have a positive or negative value.

- Low pressure fuel filter and housing inspection.
- Fuel tanks checked for water contamination.

Although not exhaustive, there was no indication of any mechanical fault or failure and no indication that further detailed inspections were required.

Related Occurrences

PWC provided information regarding 21 flameout events on PW127M engines on ATR aircraft during bad weather (rain or icing). It included this occurrence and three subsequent events. These events were on ATR72-500 and -600 variants as well as one ATR42-600.

Figure 3 shows breakdown by year:

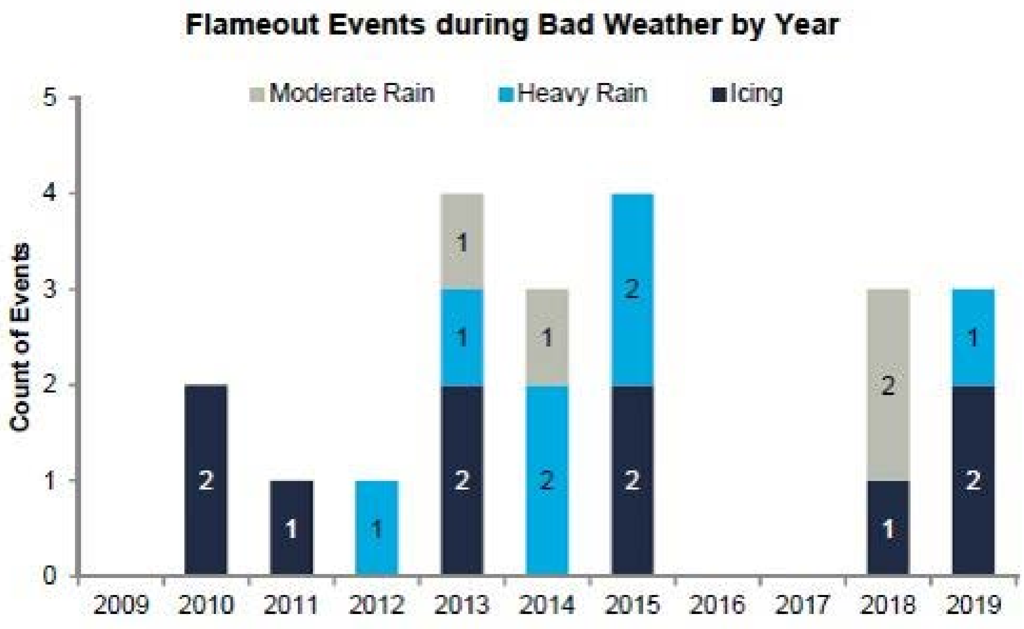
- ten were in icing conditions
- seven were in heavy rain
- four were in moderate rain.

In all cases, the automatic ignition system initiated successfully and power was restored without pilot intervention.

The earlier related occurrences prompted a water ingestion test in 2016 by PWC of the PW127M engine. As previously discussed, the engine performed in excess of the certification requirements, satisfying both PWC and ATR that the engines were capable of operating in significant adverse environmental conditions.

ATR concluded that extant guidance and standard operating procedures were sufficient. That is, in the case of a temporary power loss with automatic relight there was nothing specific to do. Should an automatic relight not occur, the checklist provided guidance for securing the engine and any subsequent restart attempt.

Figure 3: Flameout events during bad weather by year



Source: PWC

Safety analysis

Flameout causes

The ATSB considered internal causes such as a mechanical fault or failure. The engines were running smoothly and producing the required power as commanded with no signs of the impending flameout. Post occurrence maintenance was in conjunction with ATR and PWC guidance and did not identify any mechanical fault or failure. There was no evidence to suggest that a mechanical fault or failure contributed to the flameout.

Of possible external causes, fuel management and fuel quality were not considered contributory to the flameouts. However, evidence indicates that the aircraft encountered significant weather during the flight, including rain, icing and turbulence. Despite this, the ATSB considered that the flight crew managed the weather conditions appropriately and there was no evidence to suggest that the flight should have been cancelled due to those conditions.

The flight crew operating manual (FCOM) listed heavy turbulence as a possible cause of flameout. The crew described the turbulence as moderate and the recorded G load of +1.76 is consistent with crew description of the turbulence. The ATSB did not consider turbulence as contributory to the flameouts.

Icing was also included in the FCOM as a possible cause of flameout. There was no evidence of damage to engine inlets (suggesting no ingestion of large ice accretions) and the crew did not note any significant ice accretion during the flight. Engine de-ice had been on for at least 40 minutes prior to the flameouts which indicates that significant ice accretions would have been very unlikely. The aircraft exited icing conditions approximately one minute prior to first flameout (TAT had risen above 7 °C) suggesting that the conditions were suitable for dislodging any ice accretion or that they were not suitable for ice to form. There was insufficient evidence to determine if icing did or did not contribute to the flameouts.

The crew recalled that the aircraft was in heavy rain and Bureau of Metrology (BOM) radar imagery indicates moderate rain at the time. Although the engines passed certification requirements for water ingestion, numerous flameout occurrences have previously been associated with moderate or heavy rain conditions. Testing takes place in a controlled environment but does not account for engine installation and other variables of actual flight conditions. There was insufficient evidence to determine if rain did or did not contribute to the flameouts.

In the absence of evidence to the contrary, it is likely the flameouts were the result of the environmental conditions during the flight. Although the exact environmental influence could not be confirmed, it is likely this was either ice or rain, or some combination of the two.

Flameout recovery

The automatic ignition function performed as designed, recognising the drop in NH below specified criteria and automatically engaging the ignition system to relight the engines without pilot input.

The known flameout events on ATR aircraft all involved icing or moderate/heavy rain. The auto ignition system has been proven effective and reliable in providing flameout recovery and in all 21 events, as the engines successfully relit without pilot input.

In the absence of specific guidance against the use of manual ignition, the crew selected manual ignition, which operates continuously at one spark per second after the initial 25 seconds. Given the uncommon situation of two engine flameouts, the crew considered that manual ignition was a safety measure to prevent any further flameouts in that a continuous source of ignition may prevent the flame from being extinguished. This is in contrast to automatic ignition, which in the event of a further flameout, would have initially operated at a higher spark rate.

ATR advice to Virgin and other ATR operators is that in the case of a temporary power loss with automatic relight, there is nothing else to do, the system has worked as designed and restored engine power. ATR advice is that selection of manual ignition potentially lowers the flameout protection of the engine and that manual ignition should only be used when directed by a checklist. However, ATR documentation does not contain this guidance.

Findings

From the evidence available, the following findings are made with respect to the engine flameouts on descent involving ATR 72-212A, VH-FVN that occurred near Canberra, Australian Capital Territory on 13 December 2018. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

Contributing factors

- The two engine flameouts were probably the result of the environmental conditions (likely icing and/or heavy/moderate rain) during the flight.

Other factors that increased risk

- The crew selected manual ignition as a preventative measure against further flameout. While ATR recommend that manual ignition should not be selected unless directed by checklist or under minimum equipment list, this was not specifically mentioned in the ATR documentation.

Other key finding

- The aircraft automatic ignition system performed as designed by automatically relighting both engines without pilot input following flameout.

Safety actions

Additional safety actions

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

Action taken by Virgin Australia Airlines Pty Ltd

Virgin has advised the ATSB that the following safety actions have been taken:

- Provided a statement of facts of the occurrence to all ATR flight crew.
- Provided an update to ATR flight crew with regard to use of manual ignition.
- Released a flight crew operational notice formalising previous information on manual ignition use.
- Updated internal documentation (*Standard Operating Procedures Manual*) to include direction on use of manual ignition as well as reference to rain as a possible cause of flameout.

Action taken by GIE Avions De Transport Regional

- ATR has prepared communications to be provided to ATR operators (on request), advising details of this occurrence and that manual ignition is only to be selected when directed by checklist or under minimum equipment list.
- ATR commenced an internal review of aircraft documentation with the following modifications on going:
  - The addition of ‘rain’ in the potential external causes of engine flameouts
  - The addition of detailed differences between manual and automatic ignition, including a description of the role of the manual ignition push button.

General details

Occurrence details

Date and time:	13 December 2018 – 1900 ESuT	
Occurrence category:	Serious incident	
Primary occurrence type:	Engine failure or malfunction	
Location:	near Canberra Aerodrome, ACT	
	Latitude: 35º 18.4200' S	Longitude: 149º 11.7000' E

Pilot 1 details

Licence details:	Airline Transport Pilot Licence
Endorsements:	NA
Ratings:	NA
Medical certificate:	Class 1
Aeronautical experience:	6660 hours
Last flight review:	August 2018

Pilot 2 details

Licence details:	Airline Transport Pilot Licence
Endorsements:	NA
Ratings:	NA
Medical certificate:	Class 1
Aeronautical experience:	6700 hours
Last flight review:	April 2018

Aircraft details

Manufacturer and model:	ATR – GIE Avions De Transport Regional ATR72-212A	
Registration:	VH-FVN	
Operator:	Virgin Australia Airlines Pty Ltd	
Serial number:	1039	
Type of operation:	Air Transport High Capacity - Passenger	
Departure:	Sydney, NSW	
Destination:	Canberra, ACT	
Persons on board:	Crew – 4	Passengers – 42
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	None	

Sources and submissions

Sources of information

The sources of information during the investigation included:

- Flight crew of VH-FVN
- Flight data recorder and cockpit voice recorder from VH-FVN
- Virgin Australia Airlines
- GIE Avions De Transport Regional
- Pratt & Whitney Canada
- Bureau of Meteorology
- Airservices Australia

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the Australian Transport Safety Bureau (ATSB) may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the flight crew, Virgin Australia Airlines, GIE Avions De Transport Regional, Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile, Pratt & Whitney Canada, the Transportation Safety Board of Canada, Australian Bureau of Meteorology, Airservices Australia and the Civil Aviation Safety Authority.

Submissions were received from Virgin Australia Airlines and GIE Avions De Transport Regional. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

Australian Transport Safety Bureau

The ATSB is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within ATSB's jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to operations involving the travelling public.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the factors related to the transport safety matter being investigated.

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

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes it appropriate. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

Terminology used in this report

Occurrence: accident or incident.

Safety factor: an event or condition that increases safety risk. In other words, it is something that, if it occurred in the future, would increase the likelihood of an occurrence, and/or the severity of the adverse consequences associated with an occurrence. Safety factors include the occurrence events (e.g. engine failure, signal passed at danger, grounding), individual actions (e.g. errors and violations), local conditions, current risk controls and organisational influences.

Contributing factor: a factor that, had it not occurred or existed at the time of an occurrence, then either:

(a) the occurrence would probably not have occurred; or

(b) the adverse consequences associated with the occurrence would probably not have occurred or have been as serious, or

(c) another contributing factor would probably not have occurred or existed.

Other factors that increased risk: a safety factor identified during an occurrence investigation, which did not meet the definition of contributing factor but was still considered to be important to communicate in an investigation report in the interest of improved transport safety.

Other findings: any finding, other than that associated with safety factors, considered important to include in an investigation report. Such findings may resolve ambiguity or controversy, describe possible scenarios or safety factors when firm safety factor findings were not able to be made, or note events or conditions which ‘saved the day’ or played an important role in reducing the risk associated with an occurrence.