AAIB
Air Accidents Investigation Branch

AAIB Bulletin 4/2022

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The sole objective of the investigation of an accident or incident under these Regulations is the prevention of future accidents and incidents. It is not the purpose of such an investigation to apportion blame or liability.

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(ALL TIMES IN THIS BULLETIN ARE UTC)

AAIB Field Investigation Reports

A Field Investigation is an independent investigation in which AAIB investigators collect, record and analyse evidence.

The process may include, attending the scene of the accident or serious incident; interviewing witnesses; reviewing documents, procedures and practices; examining aircraft wreckage or components; and analysing recorded data.

The investigation, which can take a number of months to complete, will conclude with a published report.

ACCIDENT

Aircraft Type and Registration:	Cessna 172S, G-CFIO
No & Type of Engines:	1 Lycoming IO-360-L2A piston engine
Year of Manufacture:	2002 (Serial no: 172S9079)
Date & Time (UTC):	10 September 2021 at 0942 hrs
Location:	Ruckinge, Kent
Type of Flight:	Private (unauthorised)
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Fatal) Passengers - N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Student pilot
Commander's Age:	67 years
Commander's Flying Experience:	74 hours (of which 74 were on type) Last 90 days - 16 hours Last 28 days - 2 hours
Information Source:	AAIB Field Investigation

Synopsis

At 0958 hrs on 10 September 2021, without permission from the operator or clearance from the air traffic radio operator, a student pilot took off from Rochester Airport in G-CFIO. The aircraft was later observed to enter a steep descent to the left before it struck the ground in a field adjacent to Tar Pot Lane near Ruckinge in Kent. The pilot did not survive the accident.

Immediately prior to taking off, the pilot had reported over the aircraft radio that he had been diagnosed with a terminal illness and indicated that he intended to deliberately crash the aircraft. The pilot had not declared his diagnosis to the doctor who issued his aviation medical certificate.

History of the flight

At 0958 hrs on 10 September 2021 a Cessna 172S Skyhawk aircraft, registration G-CFIO, took off from Rochester Airport and was later found extensively damaged in a farmer's field near Ruckinge, Kent. At the controls was a student pilot who was supposed to be flying a dual training exercise with an instructor. When the instructor went via the Air Traffic Control building to gain flight approval, the pilot proceeded directly to G-CFIO, boarded it and then, without the instructor on board and without air traffic approval, taxied and took off. Prior to taking off, the pilot indicated over the radio his terminal diagnosis and his intention to deliberately crash the aircraft.

Radar evidence showed that after departing Rochester Airport, G-CFIO had flown to an area south of Ashford before loitering and carrying out a sustained series of turns. At 1044 hrs a witness 1.5 km south-southeast of the accident site saw a white aircraft to the north of them and at low level enter a “sharp” descending turn to the left. The nature, location and timing of the sighting correlated with the location of the accident site. The pilot did not survive the accident.

Accident site

Impact evidence indicated that G-CFIO had struck the ground while in a descending left turn. The area surrounding the accident site was relatively benign for a field landing. Several flat fields of an acceptable length were available to choose from, including the one in which G-CFIO’s wreckage was discovered. While the accident field was suitably long, the approach track was aligned across one corner rather than down the length of the field, leaving insufficient obstacle-free distance for a safe landing. A 30° track change to the right would have given ample ground distance for a successful field landing. There were no significant vertical obstacles close to G-CFIO’s final flight path that would have required the pilot to take avoiding action by entering a turn.

Aircraft technical examination

A detailed technical examination of the aircraft revealed several overload failures but no evidence of any pre-impact disconnection or restriction of the flight controls. The fuel tanks still contained fuel and there was evidence that the engine was under power when the aircraft struck the ground.

Medical

While the pilot reported over the radio that he had received a terminal diagnosis, this had not been declared to the Aero-medical Examiner (AME) who renewed his Class 2 flying medical certificate in June 2021. Unless an AME is the applicant’s own General Practitioner (GP) they are not entitled to review a pilot’s central medical records. Instead, pilots are required to disclose any significant medical conditions to their AME prior to issue of, and at any time during the validity of, their flying medical certificate. A diagnosis of cancer can result in the revocation of a flying medical certificate and pilots receiving such diagnoses are obliged to inform their AME.

The pilot’s GP confirmed that the pilot was diagnosed in July 2021.

Analysis

The pilot had renewed his aviation medical before receiving the terminal diagnosis but had not subsequently informed the issuing AME of the change in his medical fitness. GPs are not under any obligation to inform AMEs of significant changes to a pilot’s health.

The investigation did not find evidence of any technical failure that would have caused the aircraft to enter an uncontrolled descending left turn leading to it striking the ground.

Unless the pilot was distracted, disorientated, or medically impaired at the time, until shortly before the aircraft contacted the ground, the pilot could have levelled the wings and established an appropriate flightpath to achieve a successful landing in the accident field. The aircraft was not equipped with recording devices capable of capturing evidence of pilot distraction, disorientation, or impairment.

Conclusion

The area where G-CFIO crashed was suitable for a powered or unpowered field landing. There was no evident operational or technical reason which might explain why the aircraft approached the ground in a descending left turn from which a safe landing could not be reasonably assured. The investigation did not find evidence to support or discount a finding that pilot distraction, disorientation, or impairment contributed to the accident. Had his AME been made aware of the pilot's diagnosis, it is likely that they would have revoked the pilot's flying medical certificate.

Inquest verdict

At the pilot's inquest, the presiding Coroner recorded a verdict of suicide.

Published: 14 April 2022.

AAIB Correspondence Reports

These are reports on accidents and incidents which were not subject to a Field Investigation.

They are wholly, or largely, based on information provided by the aircraft commander in an Aircraft Accident Report Form (AARF) and in some cases additional information from other sources.

The accuracy of the information provided cannot be assured.

ACCIDENT

Aircraft Type and Registration:	Cessna 208B, Caravan (Cargomaster), G-OJMP
No & Type of Engines:	1 Honeywell TPE331-12JR-704TT turboprop engine
Year of Manufacture:	2002 (Serial no: 208B0917)
Date & Time (UTC):	17 July 2021 at 1338 hrs
Location:	Old Sarum Airfield, Wiltshire
Type of Flight:	Commercial
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Minor) Passengers - N/A
Nature of Damage:	Damaged beyond economical repair
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	47 years
Commander's Flying Experience:	5,390 hours (of which 3,746 were on type) Last 90 days - 171 hours Last 28 days - 76 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB

Synopsis

During the final approach to land, the pilot became distracted when he attempted to retrieve his kneeboard, which had fallen off the right seat into the footwell while on the downwind leg. Upon looking up after recovering it, the pilot found the aircraft was at a very low height. He therefore initiated an abrupt pitch up to arrest the rate of descent. The aircraft touched down hard in the undershoot.

The pilot suffered minor injuries and the aircraft was significantly damaged.

History of the flight

The pilot was scheduled to operate about 20 parachuting sorties from Old Sarum Airfield, Wiltshire, where the parachutists landed on the airfield. The weather was good with a wind from 030° at 9 kt and Runway 06 was in use.

During these flights, the pilot wore a full-face oxygen mask and did not secure the shoulder straps on the five-point harness. He took an A5 sized metal kneeboard that he used to record details of each flight. This was kept under his backpack-style flight bag on the right seat, the flight bag being secured by routing the seat's harness through the bag's straps.

The first 13 flights were uneventful, with the pilot taking a rest after the eleventh flight.

During some of these earlier flights the pilot was informed, over the radio by the Drop Zone (DZ) controller, that gliders had been seen circling to the south of the airfield, but the pilot was unable to visually acquire them.

The next flight proceeded without event until the post-drop descent. Prior to the descent the DZ controller advised the pilot that gliders had now been seen to the south-west of the airfield. Mindful that he had not seen any of them, and conscious that they seemed to be moving clockwise around the airfield, he decided to fly a shorter final approach path to keep the aircraft closer to the airfield and further from the gliders, rather than potentially come into conflict with the gliders during the approach and landing. The pilot thus extended his initial descent further than on the previous flights, delaying the turn downwind, with the aim of being lower abeam the threshold of Runway 06 than previously. Given the shorter final approach path, he planned to land at the beginning of Runway 06, rather than slightly deeper on the flatter section[1], as he had done on the earlier landings.

While descending on the downwind leg, the kneeboard slipped out from under the backpack into the right footwell. The pilot initially dismissed this as a minor event and continued with the circuit, which included configuring the aircraft for landing once abeam the threshold. However, on the final approach he became concerned that the kneeboard posed a possible hazard in the form of a potential restriction of the rudder pedals as he landed on the 18 m wide runway. At about 200 ft aal, having checked that the aircraft was on an appropriate flight path, he reached down to pick up the kneeboard from the footwell.

Upon looking up, after retrieving the kneeboard, the aircraft was a lot lower than expected. As a result, the pilot abruptly pitched the aircraft up in a bid to arrest the rate of descent (ROD). He described this as a “lifesaving manoeuvre”. The aircraft touched down very hard in a field about 2 m short of the airfield boundary. It then crossed a berm that borders the airfield, at which point the nosewheel began to oscillate before collapsing. The aircraft came to rest soon thereafter within the lateral confines of the runway (Figure 1).

After the aircraft came to rest, the pilot secured the engine and aircraft systems and completed the normal shutdown items. The pilot exited the aircraft unassisted using the pilot’s side door. Once outside he noticed that the flaps were up and wondered whether he had not lowered them for the landing.

The pilot sustained two small cuts to his chin, which had been inflicted by his oxygen mask.

The aircraft was damaged beyond economical repair.

Footnote

[1] See *Airfield information* section for more information about the profile of the runway.

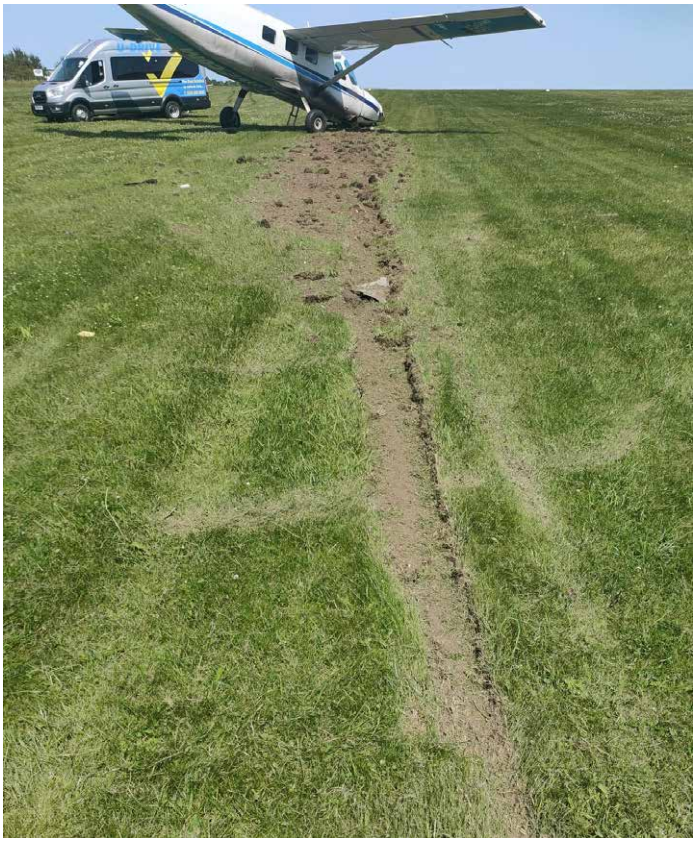

Figure 1
G-OJMP after the accident

Pilot's comments

The pilot commented that the aircraft's technical log was A4 sized. As he deemed this too large to record each flight's details as they progressed, he made his own A5 sized kneeboard. He did not secure his kneeboard on his leg, as it could potentially cause a control restriction. He added that there were no other forms of stowage in the aircraft in which to secure his A5 kneeboard or the A4 technical log.

The pilot said he had developed a habit of not wearing the shoulder straps on the five-point harness. The reason for this was that in parachute aviation he was frequently required to look over his right shoulder into the cabin or his left shoulder to see the parachutist's door or watch the dispatching ground crew. Using the shoulder straps hindered these movements, particularly rightward. While there was a small mirror on the cockpit coaming, he believed it was of limited practical use. During the moments after the landing, he vividly recalled not being able to straighten his upper body, or raise his head, as he had been effectively bent double over the control column during the landing. He added that in future he will always secure the shoulder straps.

He said that he would normally extend the flaps just before the aircraft rolled out on the final approach. He added that he would also normally complete some additional checks on the final approach to ensure the aircraft was correctly configured for landing. These included

checking the flaps were down and the approach was stable. However, he did not have the time to complete these due to the shortened circuit pattern and the distraction. While he was not certain he landed with the flaps retracted, he believes he probably did.

The pilot did not consider a go-around, principally because he was focused on recovering the kneeboard, although he added that executing a go-around would have introduced additional risk given the majority of the parachutists were still landing on the airfield at the time he made the approach. He also felt that had the kneeboard caused a restriction on the rudder pedals during the go-around there may have been controllability issues given that left rudder would have been required when power is applied in a go-around.

As a result of this accident the pilot recommended to the operator that they re-design the technical log so that it can be secured to a pilot's leg without potentially causing a control restriction. He also recommended that all pilots be established on a stable approach no closer than ½ nm from the threshold. At the time of publication, the operator had not responded to these recommendations.

Recorded information

Image recorder

The aircraft was fitted with an image recorder in the ceiling of the cockpit, between the two pilots' seats, that recorded the main instrument panel. The operator had installed it as a means of engine health monitoring.

The recording showed the pilot looking across the cockpit, in the direction of the right footwell, while the aircraft descended downwind. The aircraft entered the finals turn 18 seconds later. The recording ended just as the aircraft rolled out on the final approach at about 250 ft aal. It did not show the pilot reaching into the copilot's footwell to recover the kneeboard.

The final visible rate of descent was about 2,000 ft/min at 350 ft aal (Figure 2). This was just before the aircraft rolled out onto the final approach.

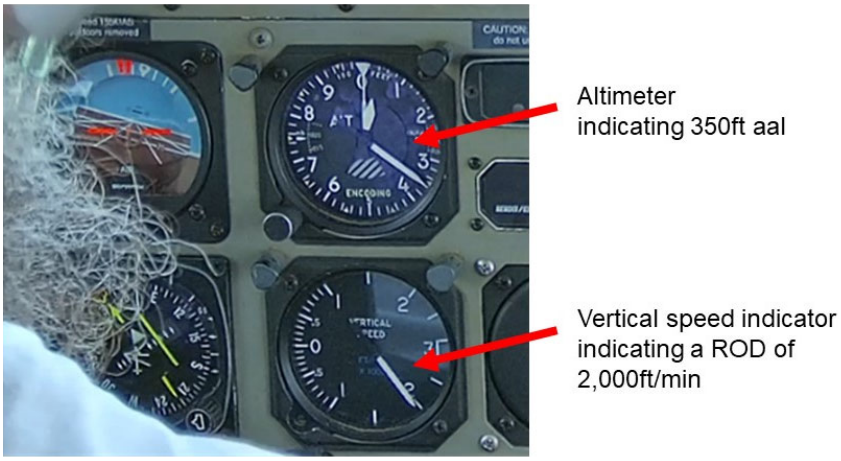

Figure 2

A still from the image recorder showing the ROD at 350 ft aal

Airfield CCTV

The accident was recorded on the airfield's CCTV camera that was pointing towards the threshold of Runway 06. It initially captured the aircraft on the final approach with a steep nose down attitude and a high ROD. The aircraft continued in this attitude until it was very close to the ground, at which point its nose was seen to pitch up abruptly (Figure 3). The aircraft then struck the ground, close to the airfield boundary.

It could not be positively determined from the CCTV if the aircraft had its flaps down during the landing.

Figure 3

A series of stills from the CCTV showing the last moments of the approach

Airfield information

Old Sarum Airfield is a disused airfield within a Parachute Drop Zone. The grass runway is orientated 06/24 and is approximately 792 m long and 18 m wide.

There is an uncropped field in the undershoot of Runway 06. The boundary between the field and the airfield has a berm that is about 7 cm high. The first part of Runway 06 has a pronounced upslope. It is then level for about the next ¼ of its length. This flat section then continues until about halfway, at which point the runway starts to gently slope down towards the Runway 24 threshold.

Electronic conspicuity

G-OJMP was not fitted with any kind of electronic conspicuity (EC) device and there were no portable EC devices at the airfield. However, the two aircraft that were used to replace the accident aircraft both had an EC device fitted in the aircraft's panel unit. Furthermore, colleagues of the pilot, who conduct parachuting flights at other locations, have been issued with portable EC devices. These devices may increase the chances of detecting other transient traffic around the drop zone, including gliders.

There is a Department for Transport funding scheme where a rebate of up to 50% of the cost of an EC device can be claimed until 31 March 2022[2].

Operations Manual

The operator's Operations Manual did not have any guidance on flying a stable approach.

Analysis

Conduct of the flight

The pilot was on his fourteenth flight of the day, with the previous 13 being uneventful. Conscious that some gliders may be flying close to the airfield he elected to fly a tighter than normal circuit pattern to try to mitigate any potential conflict.

The pilot was not able to visually acquire the gliders and there was no EC device in the aircraft that may have assisted him with his situational awareness. Had he had a better awareness of where the gliders were, perhaps aided by an EC device, his perceived need to fly an abbreviated circuit and approach might not have been necessary. The shorter circuit pattern gave him less time to deal with any possible distractions during the approach.

The image recording showed the pilot looking across the cockpit, in the direction of the right footwell, while the aircraft descended downwind about 18 seconds before the aircraft entered the finals turn. The pilot recalled that it was while on the downwind leg that the kneeboard fell into the footwell. The recording ended just as the aircraft rolled out on the final approach at about 250 ft aal. It did not show the pilot reaching into the footwell to recover the kneeboard.

Footnote

[2] See this link for more details: https://www.caa.co.uk/General-aviation/Aircraft-ownership-and-maintenance/Electronic-Conspicuity-devices/ [Accessed February 2022]

Any attempt to recover a loose article from the floor of an aircraft, while maintaining control, would need to be carried out very cautiously. However, doing so during the final 200 ft of an approach required the pilot to stop concentrating on the key priority of flying the final approach and introduced risk at a critical stage of flight. Having retrieved the kneeboard and looked up again, the aircraft was at such a low altitude that a late and abrupt pitch up was required to arrest the high ROD. Had the pilot needed an extra second or two to retrieve the kneeboard there would not have been time to make any input and the aircraft would have struck the ground in the undershoot. This would probably have led to a much worse outcome for the pilot, especially as he was not wearing the shoulder harness.

The pilot did not wear the shoulder straps as he believed they restricted his movement in the cockpit. While this seems to have given him the ability to reach into the footwell to retrieve the kneeboard, had he been wearing them he would not have been able to reach the kneeboard. This may have caused him to disregard the kneeboard and concentrate on the final approach, although he may still have been concerned that the kneeboard may have caused a control restriction on the rudder pedals during the landing. Also, had he been wearing the shoulder straps and still had a landing accident, he would have been secured in an upright posture, thus preventing him from striking parts of the aircraft structure.

The pilot did not consider a go-around because he was focused on the kneeboard. Had he made a decision to retrieve it, soon after it had fallen into the footwell on the downwind leg, he could have flown around at circuit height, or higher, while he retrieved it. Had he flown a go-around after he had decided it posed a risk, and cleared the DZ and climbed to height, he would have been better placed to look inside and recover the kneeboard. Had he had his shoulder straps secured these may have needed to be loosened or unlocked momentarily. The go-around manoeuvre may also have resulted in the kneeboard sliding backwards away from the rudder pedals, thus reducing the risk of them interfering with them before it was recovered. However, the go-around would have introduced additional risk, given the majority of the parachutists were still landing on the airfield at the time.

The pilot discovered that the flaps were up after landing. While he is not certain he landed with them up he feels he probably did. It thus seems that the distraction of the kneeboard, at such a critical stage of flight, caused the pilot to forget to lower the flaps. It also removed the opportunity for him to do his checks on the final approach to confirm the aircraft was appropriately configured for the landing.

Kneeboard

The pilot had made his own kneeboard to record flight details, but he did not strap it to his leg as he felt it could cause a control restriction. Rather, he stowed it under his flight bag on the co-pilot's seat. Had he had a kneeboard that was unlikely to restrict the controls it would not have needed to be placed in an insecure place and the accident may not have happened.

Conclusion

The aircraft landed hard due to the pilot becoming distracted at a critical stage of flight by recovering his kneeboard, which had fallen into the right footwell while on the downwind leg. The primary concern for any pilot, especially during the final approach to land, is to fly the aircraft. Had he disregarded the distraction and continued to land, or performed a go-around before retrieving it, the accident is unlikely to have occurred.

SERIOUS INCIDENT

Aircraft Type and Registration:	Leonardo AW189, G-MCGU
No & Type of Engines:	2 General Electric Co CT7-2E1 turboshaft engines
Year of Manufacture:	2014 (Serial no: 92007)
Date & Time (UTC):	4 March 2021 at 1036 hrs
Location:	3 nm south-east of Porthcawl, Wales
Type of Flight:	Emergency Services Operations
Persons on Board:	Crew - 4 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Collapsed heating duct, cabin air vent motors and auto transformer rectifier units ingested debris
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	45 years
Commander's Flying Experience:	4,507 hours (of which 595 were on type) Last 90 days - 77 hours Last 28 days - 24 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and additional enquiries by the AAIB

Synopsis

While returning from a SAR training sortie, shortly after selecting the cabin and cockpit heating ON, a heating duct failed causing fragments of duct insulation material to be discharged through the heating vents. The heating system was turned OFF but the subsequent presence of smoke, and a smell of burning, prompted an emergency landing. Several weeks later, a similar heating duct failure occurred on another of the operator's AW189 helicopters. The occupants of both helicopters suffered respiratory irritation.

The investigation determined that the heating ducts failed due to non-uniform adhesion at joints between rigid and flexible sections of duct. Interim safety action taken by the manufacturer includes the publication of a Service Bulletin to inspect and modify the installation of the heating duct. A further heating duct failure occurred on another AW189 following embodiment of the Service Bulletin and that event will be reported separately by the AAIB. At the time of publication of this report, the investigation into the recent duct failure is ongoing and the aircraft manufacturer is continuing to work with the duct manufacturer to achieve a permanent design solution.

History of the flight

Following completion of a SAR training sortie involving winching operations at Porthcawl, the helicopter transitioned into forward flight to return to its base at St Athan. The cabin and cockpit heating was selected ON and the vents opened. Approximately two minutes later, the flight crew observed light-green coloured foam debris in the cockpit, which primarily appeared to be coming from vents under the windscreen and from the adjustable vents on the left side of the cockpit. They selected the heating to OFF but subsequently detected a smell of burning and decided to land. They selected a field close to a road and completed the landing checks.

The flight crew made a PAN call to Cardiff Radar which was acknowledged. Approximately 30 – 45 seconds later, when the aircraft was approximately 100 ft agl, the smoke was seen coming from vents under the windscreen which the commander described as "whisps at first, followed by thicker grey smoke." The flight crew made a MAYDAY call to Cardiff Radar. The transmission was received but the flight crew did not hear the response due to the helicopter's low altitude.

The aircraft landed without further incident. The rear crew vacated the aircraft, all doors were opened for ventilation and the engines were shut down. The local RFFS, which had been notified by ATC, attended with the Police approximately 20 minutes after landing. The RFFS surveyed the aircraft with a thermal camera, which showed no signs of fire.

Company engineers subsequently attended the aircraft. Inspection of the aircraft and heating system revealed no additional findings. Following consultation with the company Engineering Manager, the heating system was isolated and the aircraft was ground run for 10 minutes, with no reoccurrence of the smoke. The aircraft then lifted into the hover for a further two minutes, to ensure that increased engine power did not cause the issue to reoccur, after which it was flown back to St Athan, landing seven minutes later. During the flight, the crew noted a slight smell of burnt material but there was no smoke. The rear crew returned to base by road.

Aircraft examination

Subsequent inspection by the operator's engineers showed that a heating duct in the right-hand rear area of the fuselage had collapsed and the external insulation was missing from a large section (Figure 1). The cockpit fans and two Auto-Transformer Rectifier Units (ATRUs) which have integral cooling fans and are mounted close to the failed duct, were found to have ingested duct insulation material. The duct failure occurred at 1,399 flight hours since new.

Subsequent event

On 17 April 2021 G-MCGT, another of the operator's AW 189s, experienced a heating duct failure (at 1,522 flight hours since new) when the heating was selected ON at the end of a SAR sortie. Inhalation of the resulting particles and debris was unavoidable and all crew members experienced respiratory irritation.

Figure 1

Collapsed heating duct on G-MCGU

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Aircraft information

The AW189 heating system mixes bleed-air from the engines, or the Auxiliary Power Unit (APU), with external ambient air. The heating duct takes the hot air from the engine deck down through the baggage compartment in the right rear fuselage and under the floor, where it is routed forward to supply the cockpit and cabin heating vents. The section of duct that failed runs close to the avionics rack. To accommodate a change in direction in the duct routing, this part of the duct is comprised of alternating flexible and rigid bend sections, bonded together using F6065, a two-part silicon pressure-sensitive adhesive (Figure 2).

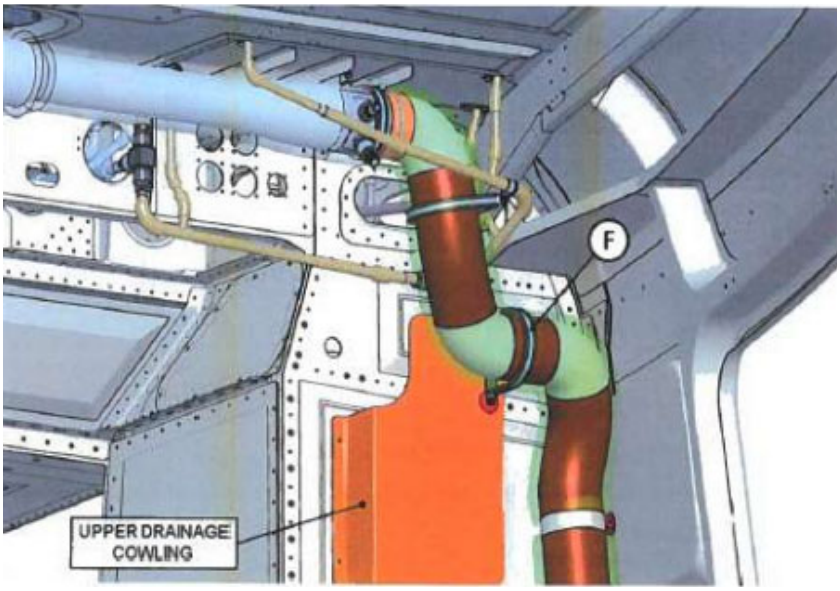

Figure 2

Heating duct on AW189 showing flexible sections in brown and rigid sections in green (Circle 'F' indicates a securing 'P-clamp')

Fleet inspection

Following the duct failure on G-MCGU, the operator issued a Technical Directive requiring a one-time inspection of the heating duct on all its AW189s within 50 flight hours. It included visual inspection of the external surface of the duct, inspection of cabin floor heating outlets and (depending on aircraft configuration) the cockpit fan inlet, for evidence of insulation fibres which might indicate a possible duct breakdown. The inspection also included operation of the heating system to check for any anomalies or unusual odour.

This inspection was performed on G-MCGT on 14 March 2021 with no findings, 31 flight hours before it experienced failure of the heating duct. The inspection had not required removal of the duct insulation material.

Previous events

Prior to the duct failure on G-MCGU, the operator had previously experienced heating duct failures on two other AW189s within its fleet. The first occurred on G-OENC, having accrued 1,077 flight hours on 26 October 2018 and the second on G-MCGN, having accrued 851 flight hours on 3 December 2019. Neither event resulted in a precautionary landing.

Component examination

The failed ducts from G-MCGU and G-MCGT were sent to the aircraft manufacturer's laboratory for examination. The manufacturer analysed the morphology of the bonding surfaces and compared those from the failed joints (highlighted by red ellipses in Figure 3) to those on the intact joints (blue ellipses). To facilitate the examination, the intact joints were manually separated by pulling the mating sections in opposite directions (denoted by black arrows).

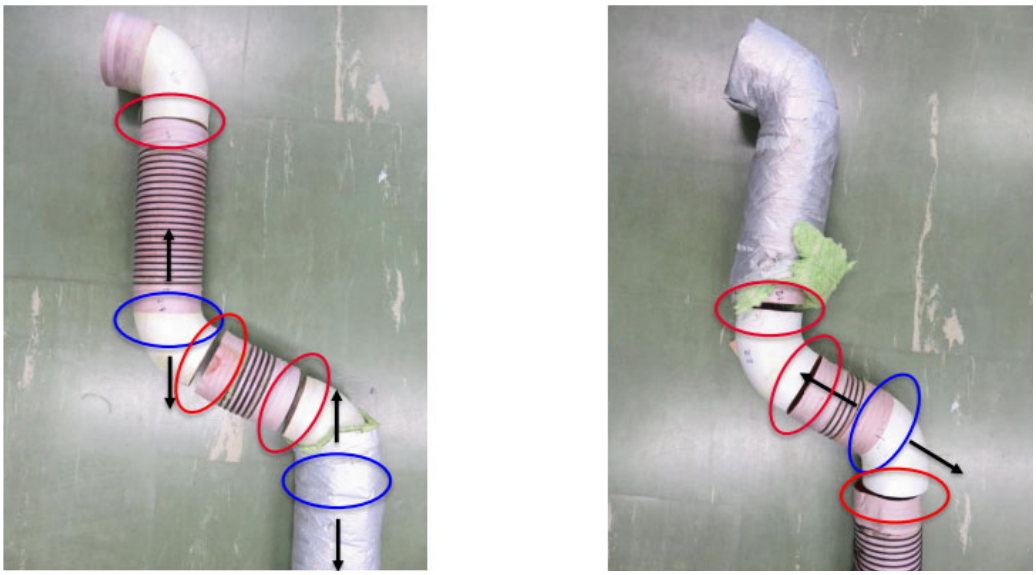

Figure 3

Failed heating ducts from G-MCGU (left) and G-MCGT (right)

On failed joints and those manually separated, adhesive was generally only present on the internal surfaces of the flexible sections. The only traces of adhesive present on the outer surfaces of the rigid bend sections appeared to be where adhesive had squeezed out from the joints during the assembly process.

In this design, the rigid bends are fabricated from composite fibre bundles arranged in a criss-cross pattern, impregnated with resin. It was noted that the rigid sections did not exhibit uniform smoothness across their entire surface; in some areas, voids were evident between the fibre bundles, while in others, resin had filled the voids (Figure 4).

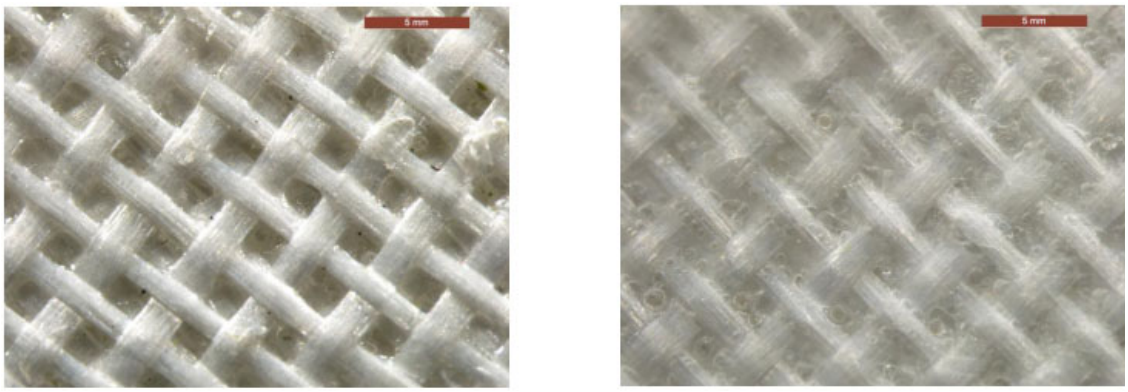

Figure 4

Surface of rigid bend sections, showing voids between fibre bundles

Several different characteristics were observed on the adhesive bonding surface, which had previously been in contact with the rigid sections:

- Some areas exhibited cubic-shaped reliefs in the adhesive (Figure 5), caused by penetration of the adhesive into the voids between the crossed fibre bundles that make up the surface of the rigid bend sections.
- Some areas exhibited well-defined imprints of the crossed fibre bundles, while others exhibited only slight imprints (Figure 6).
- Some areas exhibited small and large bubbles in the adhesive (Figure 7).

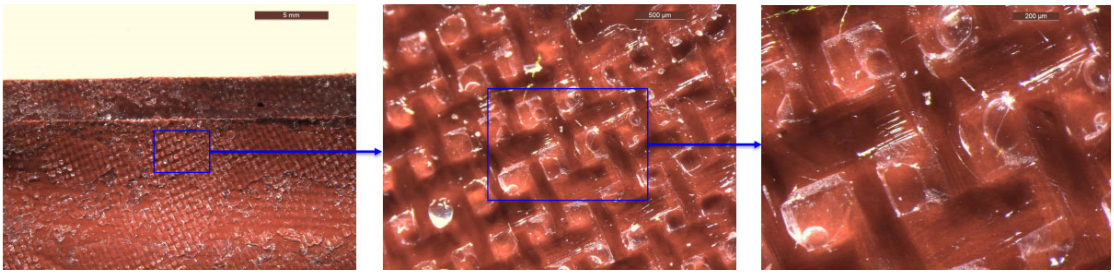

Figure 5

Cubic-shaped reliefs in adhesive, corresponding to cross-fibre bundles on rigid sections of duct

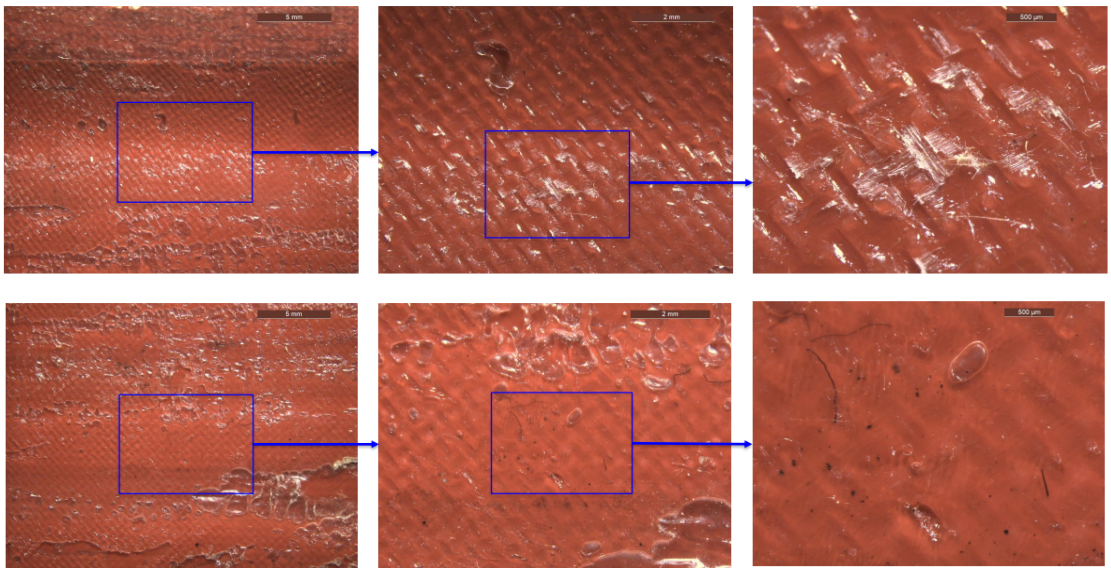

Figure 6

Areas of adhesive showing well-defined imprints from cross-fibre bundles (top row) and less well-defined imprints (bottom row)

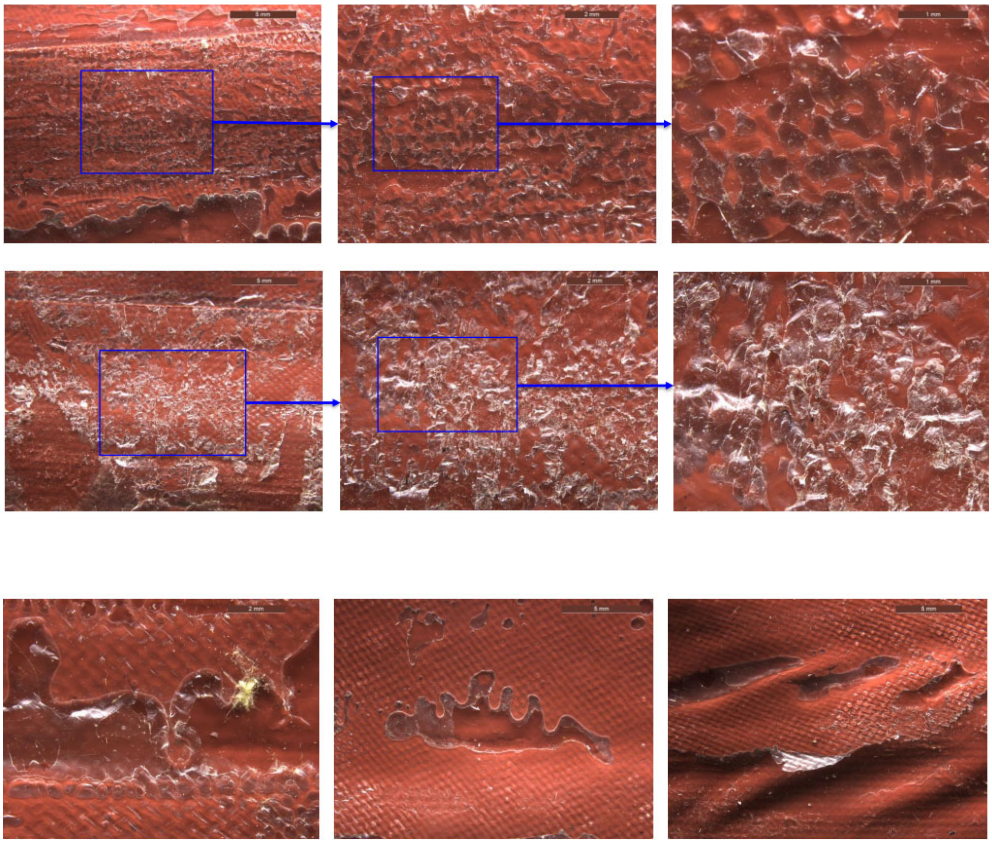

Figure 7

Areas of adhesive showing small intact bubbles (top row), small bubbles with broken film (middle row) and large bubbles (bottom row)

In general, on the intact joints the proportion of the bonding surface covered by cubic-shaped reliefs and well-defined fibre imprints was greater than the proportion which exhibited slight imprints and bubbles.

On the failed joints, the bonding surfaces showed an almost complete absence of cubic-shaped relief. A greater proportion of the surface exhibited areas of slight fibre imprints and bubbles than areas of well-defined fibre imprints.

The presence of cubic-shaped reliefs within the adhesive has a positive effect on the adhesion, as it indicates mechanical interlocking to the surface of the rigid bend sections. However, as the surface of the rigid bend sections was not uniform in respect of the presence of voids between the fibre bundles, this morphology could not be achieved across the entire bonding surface.

The manufacturer considered that the definition of imprints from the fibre bundles in the adhesive varied according to the local mating pressure between the sections. In some areas with well-defined imprints, a few fibre bundles from the rigid bend section had detached with the adhesive, when the joints separated. This suggested that the adhesion may have been effective in those areas and, in the areas with less well-defined imprints, the adhesion was likely to be weak.

The manufacturer considered that the presence of bubbles in the adhesive may have been caused by relative movement between the mating surfaces during the bonding operation prior to solidification of the sealant, due to a loss of the applied mating pressure. The bubbles were characterised by weak films of adhesive, which would originally have been in contact with the surface of the rigid bend sections. When the joints separated, these films either remained intact or broke, forming some dimples in the latter case.

The fact that only a thin film of adhesive would have been in contact with the surface of the rigid bend sections, in combination with the presence of bubbles, which represent discontinuities in the adhesive layer, would have reduced the effectiveness of the bond.

Risk assessment

The aircraft manufacturer assessed the potential safety effects of a hot air escape from a failed heating duct. The duct runs adjacent to an avionics rack and equipment in the immediate vicinity includes two radar altimeters, two GPS units and two ATRUs. For the radar altimeters and GPS units the identified failure modes relate to a potential loss of functionality. In each case, the effect of a complete loss of both units was categorised as having a severity rating of 'Major[1]'.

The ATRUs provide electrical heater power to the main and tail rotor blades as part of the aircraft's ice protection system. The manufacturer's System Safety Assessment for the AW189 full ice protection system (fitted to G-MCGU but not to G-MCGT) indicated that loss of one or both ATRUs could contribute to several functional failures. The most critical failure mode identified was an unannunciated loss of heating in the main rotor blade critical zones, which has a severity rating of 'Catastrophic[2]'.

Based on these two events, the manufacturer recalculated the functional failure probability for this failure to take account of the potential contribution of a hot air escape. The probability increased slightly from the certification figure of 1.711×10^{-10} to 1.827×10^{-10}, which is still below the safety target for a catastrophic failure condition of 1.00×10^{-9}.

Interim action

Following examination in the aircraft manufacturer's laboratory, the failed ducts were sent to the duct manufacturer for further examination to determine if there were improvements to the duct design or manufacturing which could be implemented as a long-term solution. The results of that examination were not known at the time of writing this report, however as an interim solution, Leonardo Helicopters published Service Bulletin (SB) 189-296 *'ATA 21 – Heating duct rear avionic bay inspection'* on 23 July 2021.

Footnote

1 'Major' failure conditions are defined as those which would reduce the capability of the rotorcraft or the ability of the crew to cope with adverse operating conditions to the extent that there would be, for example, a significant reduction in safety margins or functional capabilities, a significant increase in crew workload or in conditions impairing crew efficiency, physical distress to occupants, possibly including injuries or physical discomfort to the flight crew.

2 'Catastrophic' failure conditions are defined as those which would result in multiple fatalities to occupants, fatalities or incapacitation to the flight crew, or result in the loss of the rotorcraft.

The SB requires operators to perform a one-off inspection of the heating duct and to improve installation of the duct by repositioning an existing 'P-clamp' at one of the bonded joints (shown as item F in Figure 2) and introducing an additional fixing at another joint. The compliance instructions require that the SB is embodied within 400 flight hours or 12 months from date of publication, whichever occurs first.

Other information

Prior to publication of this report, the operator reported that on 10 October 2021, G-MCGM, another of it AW189s, experienced a heating duct failure prior to SB 189-296 having been embodied. The failed duct from G-MCGM was not examined as part of this investigation but given the similarities with the G-MCGU and G-MCGT duct failures, it is considered likely that the same failure mode was involved.

The operator reported a further AW189 heating duct failure on G-MCGV (S/N 92008) which occurred on 7 January 2022. SB 189-296 had been embodied on this aircraft on 30 October 2021 and the failure occurred 71 flying hours later. The failed duct has been sent to the duct manufacturer for examination to identify whether the same failure mode is involved. The examination will also inform ongoing efforts by the aircraft manufacturer and its suppliers to define a permanent design solution. The G-MCGV duct failure event will be reported separately by the AAIB.

Conclusion

The heating ducts on G-MCGU and G-MCGT failed due to non-uniform adhesion on the bonding surfaces between the rigid and flexible duct sections. This led to fragments of insulation material being discharged through the cabin in cockpit heating vents, causing respiratory irritation to the occupants and, in the case of G-MCGU, the presence of smoke which necessitated an emergency landing. The aircraft manufacturer published a Service Bulletin requiring inspection and modification of the duct as an interim solution, while it works with the duct manufacturer to achieve a permanent solution. A subsequent duct failure occurred on G-MCGV, which had the Service Bulletin embodied and this event will be reported separately by the AAIB.

Safety action

On 23 July 2021 the aircraft manufacturer published Service Bulletin 189-296, requiring operators to perform a one-off inspection of the heating duct and to modify the duct installation.

SERIOUS INCIDENT

Aircraft Type and Registration:	Beechcraft 95-B55 Baron, 2-NOVA
No & Type of Engines:	2 Lycoming O-540 piston engines
Year of Manufacture:	1961 (Serial no: TC-1272)
Date & Time (UTC):	13 August 2021 at 1232 hrs
Location:	Gloucestershire Airport
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Landing gear door damaged
Commander's Licence:	Private Pilot's Licence
Commander's Age:	53 years
Commander's Flying Experience:	398 hours (of which 31 were on type) Last 90 days - 6 hours Last 28 days - 2 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB

Synopsis

The pilot reported that he was unable to resolve an electrical problem during the flight. After the loss of aircraft electrical systems, he extended the landing gear manually, but almost ran out of fuel due to a lack of fuel quantity indication.

History of the flight

The pilot was flying the aircraft to Dunkeswell Aerodrome for its annual check. He selected the auxiliary fuel tanks during the flight, believing that they contained sufficient fuel for the intended journey. The flight was uneventful until there was an electrical problem with "a warning light" and no current flow displayed on the ammeter. Unable to rectify the problem he diverted to Gloucester Airport, where ATC told him he could land without delay. He selected the landing gear down, but the aircraft then lost electrical power. The pilot was unable to confirm if the landing gear had extended or communicate with ATC using the radio. He spoke to ATC using his mobile telephone and, after a low-level pass, they told him that the landing gear was not down.

He selected the fuel mixture to rich and the propeller pitch to fine and flew away from the airport to an area where he could orbit whilst he tried to lower the landing gear using the manual extension system. Having never done this before, he "exercised the gear twice"

to make sure it was down[1]. He was unable to monitor the fuel status because the gauges stopped working when the electrical power was lost.

He returned to Gloucester for another low-level pass to check the landing gear and approached Runway 27 "relatively steeply looking to level at 300 feet". He increased engine power just outside the airport perimeter but the left engine did not respond. The aircraft yawed to the left, bringing Runway 22 into view, and the pilot managed to land immediately without further incident.

Aircraft examination

Both hinges on the right main landing gear door were found to be broken (Figure 1). There was no other damage to the aircraft.

Figure 1

Right main landing gear door retained by the two lower links

The left auxiliary fuel tank was reported to have been found empty, and the right auxiliary tank contents were low. The main tanks were quarter-full[2], and the fuel selector was found in the auxiliary tank position.

Functional tests on the aircraft at Gloucester did not identify an electrical fault, and the pilot subsequently flew it to Dunkeswell for its annual service.

Footnote

1 The Pilot's Operating Handbook (POH) contains a cautionary note that the manual extension system should not be used to retract the landing gear.

2 This is the reported tank contents as shown on the fuel gauges.

Aircraft information

Alternators

2-NOVA is equipped with two alternators, each with its own associated ammeter (loadmeter) on the aircraft instrument panel. Each alternator can be turned ON or OFF independently using toggle switches on the instrument panel. There are two voltage regulators to control the alternators, but only one regulator is in use at any time. The pilot can select the active regulator using a two-position selector switch.

Landing gear

The landing gear is electrically actuated but there is also a manual emergency extension system. A cautionary note in the Pilot's Operating Handbook (POH) states that the emergency system should not be used to retract the landing gear. The aircraft manufacturer advised that there is very little clearance between the landing gear doors and the adjacent wing skins, and manually retracting the landing gear can pull it up too far, stressing the hinges.

Analysis

The pilot was unable to resolve the electrical problem using the alternator switches, but he did not select the alternate voltage regulator, so it is not known if this action would have rectified the issue.

The pilot used the emergency landing gear manual extension system twice, which was contrary to the POH. The aircraft manufacturer said that the landing gear can over-travel if it is retracted using the manual system, thereby adversely loading the hinges. Both hinges were found to be broken after the aircraft landed and it is possible that retracting the gear manually could have caused or contributed to this.

The pilot selected the auxiliary fuel tanks during the flight, but was unable to monitor their contents after the loss of electrical power. He believed that there was sufficient fuel for the originally intended journey but might have become preoccupied with the landing gear and did not consider his increased fuel usage and the effect of selecting the fuel mixture to rich and the propeller to fine. There was limited fuel remaining in the auxiliary tanks as he approached the airport for another flypast and the left engine did not respond when he tried to increase power. The aircraft yawed to the left as the right engine power increased, and he was able to land immediately on an alternate runway that came into view.

Conclusion

The pilot reported that the aircraft suffered an electrical problem in flight, and he was unable to restore electrical power. He used the emergency landing gear extension system twice, and almost ran out of fuel as he positioned the aircraft for a visual inspection. He was able to land immediately when the aircraft yawed to the left and an alternate runway came into his field of view.

This event is a reminder of the importance of referring to the POH in unfamiliar situations and the need to consider the implications of unexpected events on fuel status.

SERIOUS INCIDENT

Aircraft Type and Registration:	Reims Cessna F172N, G-BGIY	
No & Type of Engines:	1 Lycoming O-320-H2AD piston engine	
Year of Manufacture:	1979 (Serial no: 1824)	
Date & Time (UTC):	28 August 2021 at 1120 hrs	
Location:	Glasgow Airport	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 2
Injuries:	Crew - None	Passengers - None
Nature of Damage:	None	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	53 years	
Commander's Flying Experience:	564 hours (of which 451 were on type) Last 90 days - 26 hours Last 28 days - 8 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and further AAIB enquiries	

Synopsis

The pilot inadvertently departed with a towbar attached to the aircraft's nosewheel, having been distracted by a passenger during the pre-flight inspection.

This report considers threat and error management techniques in relation to ground procedures and passenger management. The operator has informed its members about this incident and has taken action to enhance the handling and conspicuity of its towbars.

History of the flight

The pilot was performing an introductory flight[1] from Glasgow Airport with two passengers. On arrival at the aircraft, he expressed surprise to the passengers that a towbar used for manoeuvring the aircraft on the apron had been left attached. He completed the walk around, intending to remove the towbar last. However, he became engaged in answering a question from a passenger and did not remove the towbar.

The aircraft departed from Runway 23 for a short flight in the local area, during which the pilot did not perceive anything abnormal. While returning to Runway 23, ATC relayed a message to the aircraft from an airport operations vehicle that something was attached to G-BGIY's nosewheel. The pilot immediately realised it was the towbar. He landed

Footnote

[1] Introductory flights are designed to allow people to be taken on air experience tours in aircraft.

the aircraft "slowly" and vacated the runway before stopping to remove it. There was no damage to the aircraft or the towbar.

Previous event

On 7 August 2019, a Cessna P210N departed from Southend Airport with a towbar attached[2]. The AAIB investigation of that incident revealed the pilot had been distracted by a stressful event he had experienced earlier that day. As a result of that incident, the CAA took action to promote the importance of increasing the visibility of ground equipment in the General Aviation environment[3] (Figure 1).

Figure 1

Excerpt from the CAA's 'Clued up' article about Towbars

Passengers

The pilot reported that he "discussed the importance of the walk around and ground checks" with the passengers.

The CAA's Safety Sense Leaflet 02 - *Care of passengers in general aviation aircraft*[4] states:

> *'Consider leaving the passengers in a safe and comfortable place, such as the aerodrome club house, while performing the preflight inspection or refuelling. This will allow you to concentrate on making sure the aircraft is ready for the flight'.*

Footnote

2 EMB-145EP, G-SAJK (publishing.service.gov.uk) [accessed 16 December 2021].
3 Clued Up: Towbars - SkyWise (caa.co.uk) [accessed 25 January 2022].
4 Safety Sense Leaflet 02: Care of Passengers in General Aviation Aircraft (caa.co.uk) [accessed 16 December 2021].

Sterile procedures

The EASA describes *'Sterile flight deck'*[5] operations as *'any period of time when the flight crew members shall not be disturbed… except for matters critical to the safe operation of the aircraft and/or the safety of the occupants.'*

'Notice, Understand and Think Ahead'

'Notice, Understand and Think Ahead' (NUTA) is an industry tool that defines different levels of situation awareness (SA). 'Noticing' something is a basic level of SA, progressing to 'understanding' any threat posed by it. 'Thinking ahead', representing a high level of SA, involves specifying relevant actions to avoid or deal with any error associated with the threat.

Information from the operator

The operator reported that towbars were routinely used to manually manoeuvre aircraft on the apron. As a result of this incident, it intends to improve the process of monitoring and using towbars. It will include a requirement that anyone using a towbar must keep their hand placed on it continuously while it is attached to the aircraft, only letting go once the towbar has been removed clear of the aircraft.

The operator stated its towbars were already painted "bright red", and it has attached reflective tape to them for additional conspicuity.

The operator required its members to attend an in-house safety seminar to learn from this incident.

Analysis

Using NUTA terms, the pilot indicated that he had 'noticed' the towbar, and 'understood' the threat it posed, expressing surprise that it was attached to the aircraft and intending to remove it during the walk around. Indications of 'thinking ahead' might include removing the towbar first or creating a conspicuous reminder to remove it later. Prioritising actions relating to unexpected or novel circumstances can be beneficial because those are less likely to be trapped by existing checklists and procedures.

The pilot also indicated that he 'noticed' and 'understood' the threat of distraction by the passengers by explaining to them the importance of the walk around. 'Thinking ahead' could include designating the walk around as a 'sterile' phase of flight or performing it without passengers present. Such management of the threat of distraction may be particularly significant for passengers unfamiliar with the aviation environment.

With distraction a factor, the conspicuity of the towbar may not have been significant to this incident. However, consistent with the CAA's guidance following the incident involving G-CDMH, the operator took the precaution of attaching reflective tape to its towbars.

Footnote

[5] What are 'Sterile Flight Deck Procedures'? | EASA (europa.eu) [accessed 16 December 2021].

Conclusion

The pilot did not remove the towbar before departure after becoming engaged in helping a passenger during the aircraft walk around. While there was no damage to the aircraft, this incident highlights the value of threat and error management techniques in relation to ground procedures and passengers.

ACCIDENT

Aircraft Type and Registration:	Jodel D120A, G-AVLY	
No & Type of Engines:	1 Continental Motors Corp C90-14F piston engine	
Year of Manufacture:	1967 (Serial no: 331)	
Date & Time (UTC):	27 August 2021 at 0950 hrs	
Location:	Halwell Airfield, Devon	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - 1 (Minor)	Passengers - N/A
Nature of Damage:	Substantial damage to the airframe and engine	
Commander's Licence:	National Private Pilot's Licence	
Commander's Age:	67 years	
Commander's Flying Experience:	463 hours (of which 207 were on type) Last 90 days - 7 hours Last 28 days - 4 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and additional enquiries made by the AAIB	

Synopsis

Shortly after takeoff, G-AVLY's engine lost power and a successful forced landing was carried out into a nearby field. Although the aircraft was substantially damaged, the pilot, who was wearing a full harness, sustained only minor injuries. The pilot reported a potential issue with a fuel hose but other possible reasons for the loss of engine power could not be ruled out.

History of the flight

A 25-hour engine service had recently been completed on G-AVLY and, two days prior to the accident, the propeller and magnetos were also replaced with reconditioned parts. A satisfactory engine run was carried out and, the day before the accident, the aircraft was flown to Dunkeswell and back with no reported problems.

On the day of the accident, the pilot planned to fly to Tatenhill Airfield, Staffordshire. After a thorough inspection of the aircraft, including a detailed check of the engine bay, he started the engine and taxied for departure. He performed an engine run-up which was normal, checking that the magnetos functioned correctly, and applied carburettor heat for 30 seconds before lining up on Runway 09 for takeoff. The takeoff progressed normally until G-AVLY began to climb away, at which point the pilot reported that the engine note suddenly changed and that the engine lost power. He successfully carried out a forced

landing into a nearby field and, although the aircraft was substantially damaged, he was wearing a full harness and sustained only minor injuries.

During the subsequent recovery of the aircraft, the pilot reported that when he removed the fuel delivery hose to the carburettor, the inner section of the fuel hose had remained attached to the carburettor's inlet union (Figure 1).

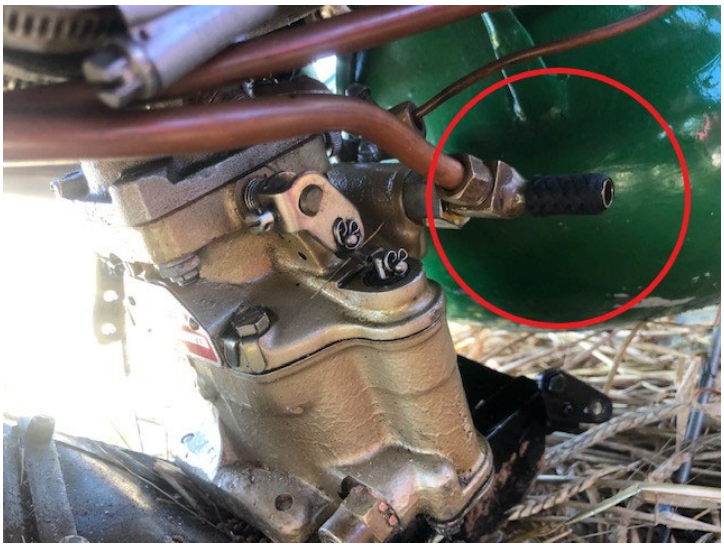

Figure 1

The inner section of the fuel hose that remained attached to the carburettor's inlet union (Image used with permission)

The fuel hose (Figure 2) is comprised of three concentric parts; an inner, fuel carrying section made of Nitrile rubber, a synthetic fibre mesh to give the whole assembly additional rigidity, and an outer Nitrile rubber sheath designed to protect the hose from external wear.

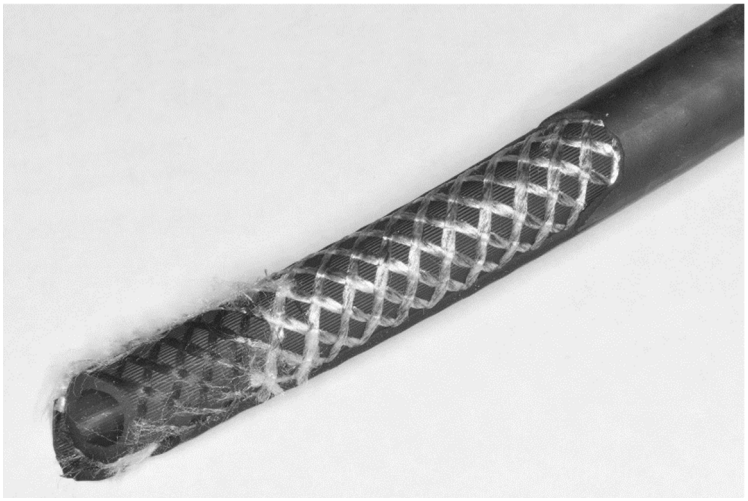

Figure 2

Sectioned fuel hose showing construction

The pilot reported that, as he detached the rest of the hose from the inlet union, he found that some of the fibre mesh material had bunched up against the face of the carburettor's fuel inlet, having potentially migrated through an internal split in the hose where it joined the inlet union. He considered that this may have caused a restriction in the engine's fuel flow and the subsequent loss of power. However, because the fuel hose was clamped to the inlet union, it would be difficult for a circumferential gap in the inner, fuel carrying section, to have opened wide enough to allow sufficient mesh material to migrate into the fuel flow.

The AAIB inspected the fuel hose and noted that the hose had a 6 mm internal diameter compared to the inlet union's outer diameter of 7.75 mm. This potentially explains why, after the accident, a section of the fuel hose remained attached to the inlet union when the hose was removed. The hose appeared to be quite brittle with age and examination of the aircraft's maintenance records indicated that it had probably been installed on the aircraft for several years[1]. It was also confirmed that the part, although designed for automotive use, was suitable for use with Avgas and Mogas, both of which G-AVLY routinely used.

Other than the fuel hose provided by the pilot, the AAIB did not examine any other parts of the aircraft and so could not exclude other possible causes for the loss of engine power.

Footnote

[1] The last recorded maintenance in the aircraft's records, associated with the carburettor system, was on the 26 April 2010.

AAIB Record-Only Investigations

This section provides details of accidents and incidents which were not subject to a Field or full Correspondence Investigation.

They are wholly, or largely, based on information provided by the aircraft commander at the time of reporting and in some cases additional information from other sources.

The accuracy of the information provided cannot be assured.

Record-only investigations reviewed: January - February 2022

16 Sep 2020 **RotorSport UK MTOSport** **G-CIFT** Glengorm, Isle of Mull

While landing in a crosswind the gyroplane bounced then touched down again on uneven ground beside the runway. The gyroplane rolled over, causing extensive damage but no injuries. The accident occurred in September 2020 but details were not reported to the AAIB until September 2021.

15 Jul 2021 **AT-16 Harvard IIB** **G-CORS** East Midlands Airport

The pilot was attempting to land the tailwheel equipped aircraft in a strong crosswind. After the initial touchdown, the aircraft become directionally unstable, resulting in a ground loop and failure of the left main landing gear leg. The pilot considered that he had not maintained sufficient aileron input on the 'into wind' wing to maintain control.

18 Jul 2021 **Aeroprakt A32 Vixxen** **G-DREW** Sandtoft Airfield, North Lincolnshire

The left wing tip touched the runway during a crosswind landing. This resulted in a heavy landing during which the nose gear collapsed.

6 Sep 2021 **Piper PA-28-161** **G-BSBA** Lydeway Field Airstrip, near Devizes, Wiltshire

On landing, and during braking, the aircraft slewed and then left the grass runway. The right wing struck a hedge causing the wing to detach.

18 Sep 2021 **Vans RV-12** **G-RMPS** Kingsmuir Airfield, Fife

Following a short solo flight, the pilot positioned the aircraft for landing. On crossing the runway threshold, the pilot felt he was travelling slightly faster than expected. After touching down the aircraft bounced and the pilot decided to hold off but the aircraft did not settle. The nose landing gear collapsed before he could initiate a go-around.

10 Nov 2021 **Rans S6-ESD** **G-MYDK** Near Eshott Airfield, Northumberland

The aircraft's engine stopped as the pilot reduced power on final approach to Runway 19. The aircraft caught the top of a hedge as the pilot attempted to land in a crop field short of the runway, and it came to rest inverted. Examination of the aircraft following the accident revealed a significant quantity of water in the fuel filter, and the pilot stated that the probable cause of the engine stoppage was water ingestion into the carburettors.

Record-only investigations reviewed: January - February 2022 cont

21 Dec 2021 **DHC-1 Chipmunk 22** **G-CLLI** Brunton Airfield, Northumberland

The engine malfunctioned and the pilot made a precautionary landing at a disused airfield. Towards the end of the landing roll the passenger, seated in the front, alerted the pilot (whose view from the back seat was less good) about an obstacle ahead. The pilot manoeuvred to avoid it and the tip of the left wing was damaged when it hit a fence post. The pilot reported that his experience and familiarity with the aircraft gave him confidence to choose the landing site promptly and handle the precautionary landing, assisting the safe outcome.

9 Jan 2022 **Vans RV-6** **G-OPAR** Graveley, Hertfordshire

The pilot had made two earlier attempts to land which had been unsuccessful because of the loss of visibility in the final stages of the approach due to flying towards the sun, which was low on the horizon. The third attempt to land resulted in the aircraft landing short, on a golf course. The aircraft's landing gear collapsed and the propeller was damaged.

16 Jan 2022 **Aero AT-3 R100** **G-SYEL** Sywell Aerodrome, Northamptonshire

During a student solo flight the aircraft bounced on landing, damaging the nose landing gear.

20 Jan 2022 **Just SuperSTOL** **G-JWNI** Private farmstrip, Killinchy, County Down

The pilot, who reported approximately 2.5 hours experience as pilot in command on the aircraft type, was attempting to land on a short farm strip. He reported that he misjudged his height over the hedge at the start of the field. The aircraft's wheels clipped the hedge causing it to pitch forward and collide with the ground, stopping inverted.

31 Jan 2022 **Cessna T210N Turbo Centurion II** **N9533Y** Cumbernauld Airport, North Lanarkshire

The pilot landed the aircraft with the wheels up after a short positioning flight from Edinburgh to Cumbernauld. Although experienced with over 1,100 hours on type, the pilot had being been flying a business jet exclusively for the two years up to the day of the accident. The pilot was acutely aware that the runway at Cumbernauld was relatively short (about 820 m) compared to anywhere he had landed in the previous two years, and was so focussed on getting the landing correct that he forgot to complete the pre-landing and final approach checks.

Record-only investigations reviewed: January - February 2022 cont

19 Feb 2022 **RotorSport UK MTOSport** **G-CIHH** Perth Airport, Perthshire

During takeoff the rotor flapped back and hit the tail. The rudder, propeller tips and the underside of both rotor blades were damaged. The pilot aborted the takeoff and taxied back. The event was probably due to low rotor RPM for takeoff.

20 Feb 2022 **Cessna 172N** **G-BONO** Perranporth Airfield, Cornwall

The aircraft had flown to Perranporth, in Cornwall, from Northern Ireland in challenging wind conditions. Whilst taxiing outside the hangar at Perranporth Airfield, a gust of wind under the right wing tipped the aircraft, causing the left wing tip and the propeller to hit the ground.

Note: The entry for this report was incorrectly entered and was amended online on 12 May 2022. Full details can be found in the June 2022 Bulletin.

27 Feb 2022 **Piper PA-28-235** **G-CCBH** Welshpool Airport, Powys

The aircraft departed the side of the runway after landing in a gusting crosswind. It struck a fence which caused damage to the aircraft's wings and exhaust.

Miscellaneous

This section contains Addenda, Corrections and a list of the ten most recent Aircraft Accident ('Formal') Reports published by the AAIB.

The complete reports can be downloaded from the AAIB website (www.aaib.gov.uk).

TEN MOST RECENTLY PUBLISHED FORMAL REPORTS ISSUED BY THE AIR ACCIDENTS INVESTIGATION BRANCH

1/2015 Airbus A319-131, G-EUOE
London Heathrow Airport
on 24 May 2013.

Published July 2015.

2/2015 Boeing B787-8, ET-AOP
London Heathrow Airport
on 12 July 2013.

Published August 2015.

3/2015 Eurocopter (Deutschland)
EC135 T2+, G-SPAO
Glasgow City Centre, Scotland
on 29 November 2013.

Published October 2015.

1/2016 AS332 L2 Super Puma, G-WNSB
on approach to Sumburgh Airport
on 23 August 2013.

Published March 2016.

2/2016 Saab 2000, G-LGNO
approximately 7 nm east of
Sumburgh Airport, Shetland
on 15 December 2014.

Published September 2016.

1/2017 Hawker Hunter T7, G-BXFI
near Shoreham Airport
on 22 August 2015.

Published March 2017.

1/2018 Sikorsky S-92A, G-WNSR
West Franklin wellhead platform,
North Sea
on 28 December 2016.

Published March 2018.

2/2018 Boeing 737-86J, C-FWGH
Belfast International Airport
on 21 July 2017.

Published November 2018.

1/2020 Piper PA-46-310P Malibu, N264DB
22 nm north-north-west of Guernsey
on 21 January 2019.

Published March 2020.

1/2021 Airbus A321-211, G-POWN
London Gatwick Airport
on 26 February 2020.

Published May 2021.

Unabridged versions of all AAIB Formal Reports, published back to and including 1971, are available in full on the AAIB Website

http://www.aaib.gov.uk

GLOSSARY OF ABBREVIATIONS

aal	above airfield level
ACAS	Airborne Collision Avoidance System
ACARS	Automatic Communications And Reporting System
ADF	Automatic Direction Finding equipment
AFIS(O)	Aerodrome Flight Information Service (Officer)
agl	above ground level
AIC	Aeronautical Information Circular
amsl	above mean sea level
AOM	Aerodrome Operating Minima
APU	Auxiliary Power Unit
ASI	airspeed indicator
ATC(C)(O)	Air Traffic Control (Centre)(Officer)
ATIS	Automatic Terminal Information Service
ATPL	Airline Transport Pilot's Licence
BMAA	British Microlight Aircraft Association
BGA	British Gliding Association
BBAC	British Balloon and Airship Club
BHPA	British Hang Gliding & Paragliding Association
CAA	Civil Aviation Authority
CAVOK	Ceiling And Visibility OK (for VFR flight)
CAS	calibrated airspeed
cc	cubic centimetres
CG	Centre of Gravity
cm	centimetre(s)
CPL	Commercial Pilot's Licence
°C,F,M,T	Celsius, Fahrenheit, magnetic, true
CVR	Cockpit Voice Recorder
DME	Distance Measuring Equipment
EAS	equivalent airspeed
EASA	European Union Aviation Safety Agency
ECAM	Electronic Centralised Aircraft Monitoring
EGPWS	Enhanced GPWS
EGT	Exhaust Gas Temperature
EICAS	Engine Indication and Crew Alerting System
EPR	Engine Pressure Ratio
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
FAA	Federal Aviation Administration (USA)
FDR	Flight Data Recorder
FIR	Flight Information Region
FL	Flight Level
ft	feet
ft/min	feet per minute
g	acceleration due to Earth's gravity
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
hrs	hours (clock time as in 1200 hrs)
HP	high pressure
hPa	hectopascal (equivalent unit to mb)
IAS	indicated airspeed
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IP	Intermediate Pressure
IR	Instrument Rating
ISA	International Standard Atmosphere
kg	kilogram(s)
KCAS	knots calibrated airspeed
KIAS	knots indicated airspeed
KTAS	knots true airspeed
km	kilometre(s)
kt	knot(s)
lb	pound(s)
LP	low pressure
LAA	Light Aircraft Association
LDA	Landing Distance Available
LPC	Licence Proficiency Check
m	metre(s)
mb	millibar(s)
MDA	Minimum Descent Altitude
METAR	a timed aerodrome meteorological report
min	minutes
mm	millimetre(s)
mph	miles per hour
MTWA	Maximum Total Weight Authorised
N	Newtons
N_R	Main rotor rotation speed (rotorcraft)
N_g	Gas generator rotation speed (rotorcraft)
N_1	engine fan or LP compressor speed
NDB	Non-Directional radio Beacon
nm	nautical mile(s)
NOTAM	Notice to Airmen
OAT	Outside Air Temperature
OPC	Operator Proficiency Check
PAPI	Precision Approach Path Indicator
PF	Pilot Flying
PIC	Pilot in Command
PM	Pilot Monitoring
POH	Pilot's Operating Handbook
PPL	Private Pilot's Licence
psi	pounds per square inch
QFE	altimeter pressure setting to indicate height above aerodrome
QNH	altimeter pressure setting to indicate elevation amsl
RA	Resolution Advisory
RFFS	Rescue and Fire Fighting Service
rpm	revolutions per minute
RTF	radiotelephony
RVR	Runway Visual Range
SAR	Search and Rescue
SB	Service Bulletin
SSR	Secondary Surveillance Radar
TA	Traffic Advisory
TAF	Terminal Aerodrome Forecast
TAS	true airspeed
TAWS	Terrain Awareness and Warning System
TCAS	Traffic Collision Avoidance System
TODA	Takeoff Distance Available
UA	Unmanned Aircraft
UAS	Unmanned Aircraft System
USG	US gallons
UTC	Co-ordinated Universal Time (GMT)
V	Volt(s)
V_1	Takeoff decision speed
V_2	Takeoff safety speed
V_R	Rotation speed
V_{REF}	Reference airspeed (approach)
V_{NE}	Never Exceed airspeed
VASI	Visual Approach Slope Indicator
VFR	Visual Flight Rules
VHF	Very High Frequency
VMC	Visual Meteorological Conditions
VOR	VHF Omnidirectional radio Range

AAIB
Air Accidents Investigation Branch