SERIOUS INCIDENT

Aircraft Type and Registration:	1) Boeing 737-8AS, EI-DPC 2) Boeing 737-8Z9, G-GDFR 3) Boeing 757-28A, G-OOBA
No & Type of Engines:	1) 2 CFM56-7B27 turbofan engines 2) 2 CFM56-7B26 turbofan engines 3) 2 Rolls-Royce RB211-535E4-37 turbofan engines
Year of Manufacture:	1) 2006 (Serial no: 33604) 2) 2003 (Serial no: 30421) 3) 2000 (Serial no: 32446)
Date & Time (UTC):	8 September 2020 at 2227 hrs
Location:	Birmingham Airport
Type of Flight:	1) Commercial Air Transport (Passenger) 2) Commercial Air Transport (Passenger) 3) Commercial Air Transport (Passenger)
Persons on Board:	1) Crew - 6 Passengers - 35 2) Crew - 6 Passengers - 181 3) Crew - 8 Passengers - 190
Injuries:	1) Crew - None Passengers - None 2) Crew - None Passengers - None 3) Crew - None Passengers - None
Nature of Damage:	1) None reported 2) None reported 3) None reported
Commander's Licence:	1) Airline Transport Pilot's Licence 2) Airline Transport Pilot's Licence 3) Airline Transport Pilot's Licence
Commander's Age:	1) N/A 2) N/A 3) N/A
Commander's Flying Experience:	1) N/A 2) N/A 3) N/A
Information Source:	AAIB Field Investigation

Synopsis

After completing some routine maintenance on the approach lights to Runway 33 at Birmingham Airport, two airport engineering services technicians drove along the runway in an airport works pickup truck en route to their next task. In the back of the pickup truck was a step ladder that they had been using. As they drove through the touch down zone, the ladder came out of the vehicle and came to rest just to the right of the runway centreline. Three aircraft subsequently landed on Runway 33. The first two aircraft reported that they

might have seen something on the runway during landing but could not be certain that it was not paint markings. Having been informed of the reports of the two preceding aircraft, the third aircraft elected to land, following which the flight crew notified ATC that they had seen a ladder on the runway. The ladder had been on the runway for 37 minutes before it was retrieved by the airport safety team.

The airport completed an investigation into the events and have taken a number of safety actions intended to prevent reoccurrence. The CAA issued a SkyWise notification under Aerodrome Safety Alerts to raise awareness of this event amongst airside workers.

History of the flights

Birmingham Airport had four scheduled arrivals after 2200 hrs on the night of the incident. Three of the arrivals were radar vectored to land on Runway 33 with a separation of 4 nm between each aircraft.

The first aircraft (EI-DPC) landed at 2225 hrs. Two minutes later the second aircraft (G-GDFR) landed and on vacating the runway the crew advised ATC that they may have seen something in the touch down zone. They were not sure if it was an object of some sort or a paint marking on the runway. The crew from EI-DPC then commented that they may have also possibly seen something just after the touch down markers. The tower controller contacted the third aircraft (G-OOBA) on the final approach and asked if they were happy to continue given the report from the two previous aircraft. The crew elected to continue and landed at 2229 hrs. As the aircraft slowed to vacate the runway, the crew informed ATC that there was an object in the touch down zone, just to the right of the centreline, possibly a ladder.

ATC ordered a runway inspection, which found a 7 ft A-frame step ladder on the runway.

This was subsequently established to have fallen from a pickup truck referred to as Works Vehicle 4 (WV4) as it had travelled along the runway after technicians had completed earlier maintenance on the approach lights to Runway 33. Figure 1 shows a view looking up Runway 33 with the ladder on the runway.

The runway was immediately closed. A full inspection was carried out before re-opening after 19 minutes as nothing else was found. The fourth arriving aircraft was 50 nm behind the three previous aircraft and was given an arrival hold until the runway reopened. This aircraft landed at 2254 hrs.

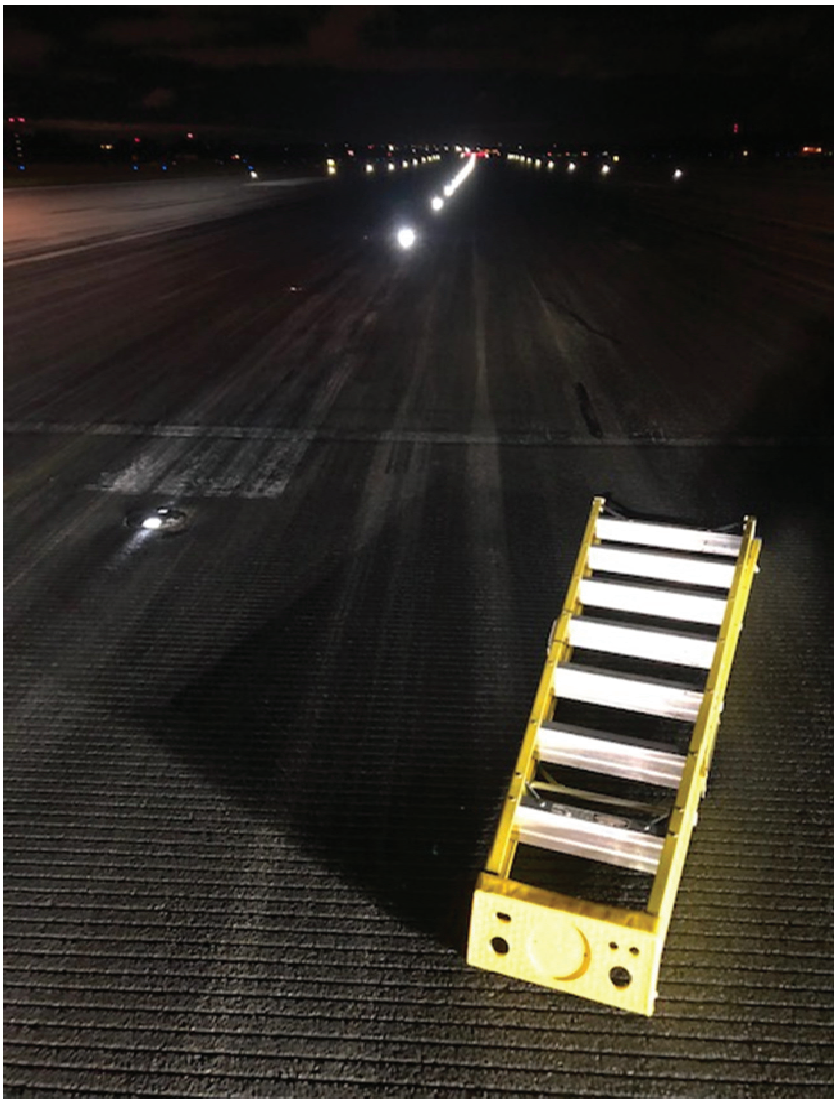

Figure 1

View up Runway 33 with the ladder in the approximate position it was found

Airfield information

Birmingham Airport has a single runway orientated 15/33. The runway has a grooved asphalt surface. The runway is also fitted with supplementary lights within the touchdown zone for low visibility operations. The passenger terminal and airport services are located on the east side of the runway. The west side of the runway is used by private flight companies, cargo operations and a police helicopter. The ATC tower is located on the west side of the runway. Figure 2 shows the layout of the airport and Figure 3 shows a magnified view with details of the locations referred to in this report.

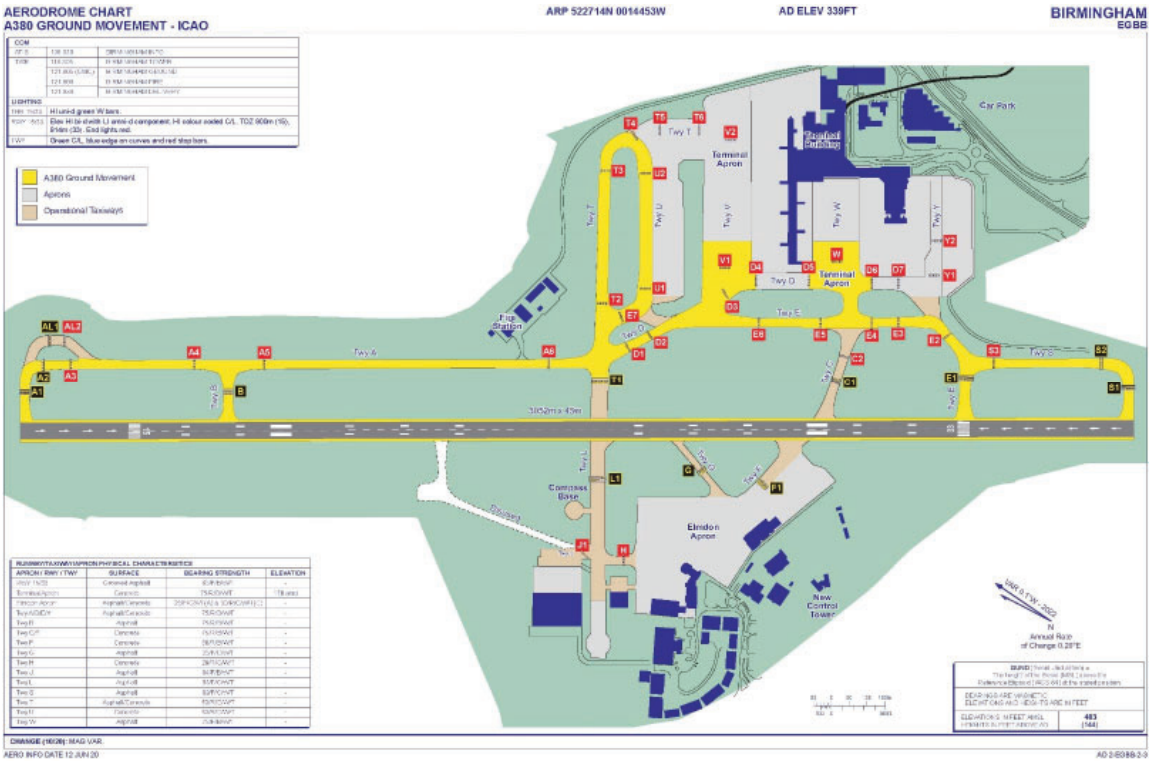

Figure 2

Layout of Birmingham Airport

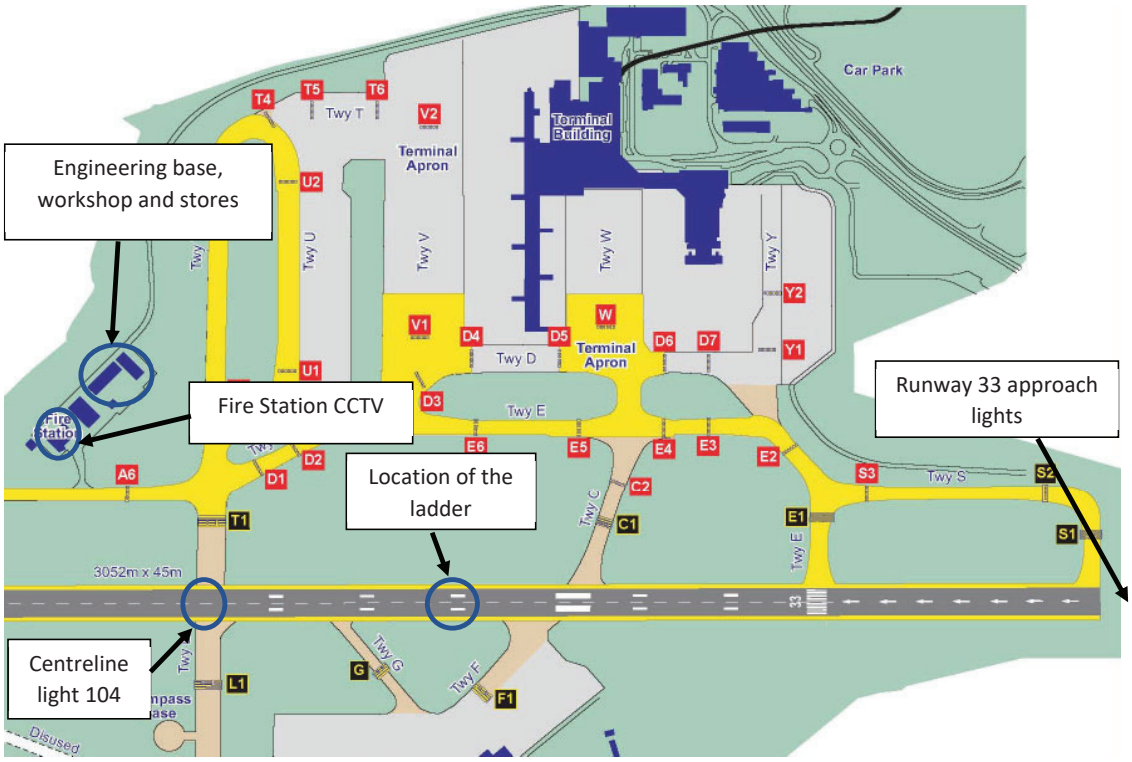

Figure 3

Magnified view of the airport

The last runway inspection was completed at 2128 hrs with nothing found on the runway. The last aircraft movement before the three subsequent landings was a departure from Runway 15 at 2135 hrs.

The airport has surface movement radar (SMR) and all the airfield vehicles were fitted with transponders that identify the vehicle and its position on the SMR display in the ATC tower. The SMR at Birmingham is not designed to detect foreign object debris (FOD).

Airfield working

Engineering services are responsible for the maintenance of most of the airport facilities including the terminal buildings, baggage system and airfield lighting. Several teams worked at the airport at any one time completing routine maintenance, fixing reported faults and testing of the systems. Each team consisted of at least two members.

Driver training

The airport operator reported that as part of its airside driver permit training package, a presentation was delivered to all movement[1] area drivers that included the requirement to ensure that all loads were secure before undertaking journeys. It also reminded drivers of their responsibilities to ensure vehicles were in a safe condition prior to use. Whilst there was no specific emphasis on FOD prevention during airside driver training, the airport had standing instructions on load security and FOD applicable to all airside area drivers.

Equipment

Available vehicles

The engineering services staff had several work vehicles available and authorised for use on the airfield. These vehicles, referred to as Works Vehicles (WV), consisted of the following.

- WV3 was a large long wheelbase van fitted out inside as a mobile workshop. It contained tools, spares and equipment suitable for most tasks undertaken by the ground engineering staff. It was equipped with two-way radio communication and external work spotlights mounted on the left side of the roof. Although WV3 was well equipped for the majority of airfield tasks its reliability was a cause for concern amongst the staff.

- WV4, the vehicle from which the ladder fell, was an all-wheel drive crew cab pickup truck with an open load bay and latched tail gate. The load bay was fitted with a rigid black plastic liner and there were two fixed cargo restraint rings attached towards the front and rear of the load side panels. The vehicle was also fitted with two-way radio communication and external work spotlights mounted on a roof rail on the left side.

Footnote

[1] That part of an aerodrome intended for the surface movement of aircraft including the manoeuvring area, aprons and any part of the aerodrome provided for the maintenance of aircraft.

- WV10 was a large crew cab panel van with a plywood lined cargo bay. It was fitted with two-way radio communication but was not fitted with external work spot lighting. This vehicle was primarily used as a backup vehicle but was reported by the technicians as not being popular because of the difficulty in restraining equipment and tools in the rear load bay.

The technicians chose to use WV4 as they were concerned about the reliability of WV3 for working on the runway, and the security of equipment on WV10.

Tools, maintenance equipment and spares

The engineering services staff operated from a self-contained set of buildings on the northerly side of the airport near to the fire station and airfield operations complex (Figure 3). They consisted of administrative offices and crew rooms alongside workshops and storage units. The vehicles were readily accessible in a yard close by.

There were several storage areas within the units which were fitted out with heavy duty steel shelving. These held a variety of spares to support the airport infrastructure within domestic buildings and the airport outside lighting, guidance systems and signage. Some larger tools were also kept on the shelves alongside the spares. Spares and equipment were selected and replenished by the staff on an as-required basis. There was no formal spares and equipment withdrawal or location log, and staff advised that they generally knew what was available and where items were kept.

Ladder found on runway

The ladder was of a lightweight A-frame of fibreglass and aluminium construction, was 2.2 m high and had 7 steps. It was painted bright yellow and there was a polypropylene combined step and hinge plate at the top of the ladder. It had been designed for ease of handling and could be set up and positioned by one person. The ladder was in good working condition.

Ladder restraint used in WV4

An elastic bungee was used to restrain the ladder in the vehicle. It was approximately 80 cm long and 10 mm in diameter with woven sheathing around its elastic strands. It was fitted with a plastic covered open-steel wire hook at each end. The diameter of the wire used to form the hook is approximately 2 mm to 3 mm. The bungee could be stretched approximately 1.25 times its own length and this was limited by the sheathing at which point it became rope like.

The bungee was taken from an understair storage cupboard in the main workshop storage unit.

In preparation for the work on the approach light the stepladder was put into the load bay of WV4 and the elastic bungee strap used to secure it in place. Figures 4 and 5 show how the ladder was positioned and held in the load bay.

Figure 4
Ladder loaded onto WV4

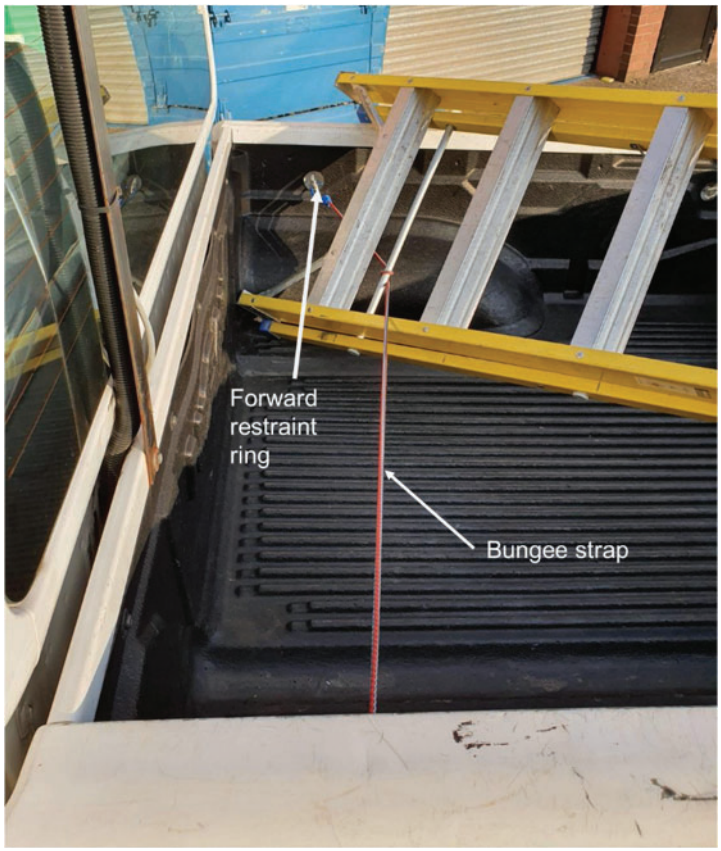

Figure 5
Ladder restraint method in WV4
(Picture taken after the event and reconstructed by one of the technicians)

The bungee prompted some discussion after the event. The items in the understair storage cupboard appeared to be stored haphazardly and contained a selection of smaller items related to airfield maintenance and domestic equipment. Senior members of the engineering staff did not consider the bungee a normal part of their equipment and were not clear on its providence. However, they were able to show more suitable ratchet straps, although it took a short while to locate them on one of the equipment shelves in another storage area.

During examination of WV4 and the ladder, a safer method of carrying the ladder was demonstrated. The ladder was placed upright in the load area angled forward, leaning against a vertical frame attached to the roof bars with its feet against the base of the tailgate. The frame was ideally placed to fix the ladder in place with a ratchet strap.

Damage to equipment

The ladder was recovered from the runway by the airport operations staff. Later examination of the ladder found minor scuff damage on the corner edges of the combined step and hinge plate. A small amount of material towards the edge of the scuff marks had been frayed and discoloured with a grey-black appearance (Figure 6). The bungee was examined, and this was in good condition except for the opening out of one of its hooks (Figure 7).

Figure 6

Scuff damage to the top of the ladder

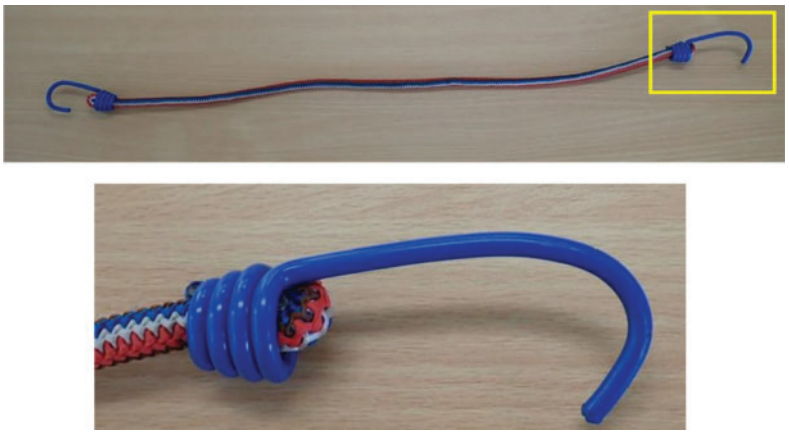

Figure 7

Bungee strap and damage to hook

Personnel – technicians

On the night of the incident, a team of two technicians were working airside and responsible for the airfield lighting. Both technicians were qualified electricians. They had been working together as a team for less than a month. They were on their second of two nightshifts after two days off and were scheduled to be off for the next two days.

Whilst working as a pair on airfield lighting, especially on the runway or taxiways, it was standard practice for one technician to remain in the vehicle whilst the other technician completed the work. This meant that if the runway or taxiway was needed by ATC, then the vehicle could be readily moved.

Technician 1

Technician 1 had been working at the airport for ten months. He had some limited previous experience in the aviation sector as an electrician at a manufacturing plant, but this was his first job working on an airport. He had been supervised by more experienced technicians during his training. During the period related to the incident, Technician 1 was driving the vehicle.

Technician 2

Technician 2 had been working at the airport for 18 months. He previously worked as a technician in an automated plant in the logistics industry, but he had been given training for his role at the airport. During the period related to the incident, Technician 2 was performing the work outside of the vehicle.

Order of work for the technicians

When the technicians arrived for their shift there was a list of items for them to complete during the night if there was sufficient time available. This included some routine maintenance tasks on the Runway 33 approach lights and some of the centreline lights. They also needed to complete a check of all the runway lights in both directions. Technician 2 went out to complete a small job whilst Technician 1 remained at the engineering base. When Technician 2 returned, he rang ATC to ask when it might be possible to access the runway to perform the all lights check, work on the approach lights and the centreline lights task. He was informed that there would be a gap of around an hour beginning at 2130 hrs. The two technicians then began to prepare their equipment for the tasks and to load the WV4 which they had selected.

Technician 2 loaded the ladder, which would be required to access the approach lights, into the back of WV4. Having collected all their equipment, they set off for the runway with Technician 1 driving and Technician 2 in the front passenger seat. The routing from the engineering base to the runway required the vehicle to pass in front of the airfield fire station. The front of the fire station had a CCTV camera fitted (Figure 8). Although it was dark, the camera did capture the vehicle each time it passed. WV4 was seen passing the fire station at 2133 hrs.

Figure 8

WV4 passing the fire station at 2133 hrs

At 2135 hrs WV4, having gained permission from ATC, entered Runway 33 from holding point S1. The vehicle then parked at the edge of the grass in the undershoot of the runway. Figure 9 shows part of the SMR picture with WV4 (highlighted) parked at the beginning of Runway 33.

Figure 9

WV4 at the beginning of Runway 33

Once the vehicle was parked, Technician 2 got out of the vehicle, took the ladder from the back and proceeded down to the approach lights. Technician 1 remained in the vehicle. The maintenance work took approximately 15 minutes and upon returning to WV4, Technician 2 stated he secured the ladder in the back using the bungee, before returning to the passenger seat. WV4 then proceeded along the runway whilst the technicians checked the lights. This involved inspecting the centreline lights, edge lights and the supplementary lights in the touch down zone. This was the only time from when they left the engineering base at 2133 hrs to begin the work on the approach lights that they passed the point on the runway where the ladder was subsequently found; WV4 was calculated to be travelling at about 45 mph at the time when the ladder fell from the vehicle. Figure 10 shows the point at which they passed that point on the runway. The time was 2154 hrs.

Figure 10

WV4 at the location where the ladder was found

Having driven to the end of Runway 33, WV4 was then turned around and headed for the first centreline light they were to attend to, which was number 104 (see Figure 3). The scheduled maintenance requirements for the centreline lights was to check the torque on the bolts holding the lights in position. To do this the technicians had a wireless Bluetooth-equipped electronic torque wrench. This indicated to the technician doing the work when the correct torque was applied, and also transmitted the data to a mobile device which recorded the date and time of the work. When they reached centreline light 104, Technician 2 again got out the vehicle to complete the work. When he attempted to wirelessly connect the torque wrench with the mobile device, he found it would not do so and they therefore had to return to the engineering base in order to get it to work as required. WV4 vacated the runway at 2159 hrs. To drive to the engineering base, WV4 passed the front of the fire station and was captured on CCTV. Figure 11 is a CCTV image of WV4 with the tailgate of the truck up, but the ladder not present.

Figure 11

CCTV of WV4 returning to the engineering base at 2159 hrs

When WV4 reached the engineering base, Technician 2 exited the vehicle and proceeded inside to get the torque wrench and mobile device to communicate. Technician 1 remained in the driver's seat waiting for his colleague. At 2204 hrs they passed the front of the fire station en route to continue the maintenance on the runway centreline lights.

WV4 asked for and received ATC permission to enter Runway 33 from holding point T1. They proceeded to centreline light 104 and began to work their way towards the end of the runway from centreline light to centreline light. Again Technician 2 was completing the work whilst Technician 1 was driving the vehicle to the right of the centreline in support of his colleague. The vehicle exterior side spotlights were illuminating the work area for Technician 2.

At 2218 hrs Technician 1 was informed by ATC that the first inbound aircraft was 20 nm from touchdown. This was acknowledged by Technician 1, and Technician 2 got back into the vehicle before they vacated the runway via Taxiway B. The vehicle again passed the fire station at 2220 hrs as shown at Figure 12. Note, the tailgate of the truck is up, and the ladder is not present.

Figure 12

WV4 passing the fire station at 2220 hrs

The technicians returned to the engineering base and went inside with the aim of establishing when there might be another gap in aircraft movements to enable them to complete their checks on the runway centreline lights. Having established that there would be a gap after the next landing aircraft, they proceeded back to WV4 ready to go out to the runway. As they approached the vehicle, they realised that the ladder was missing. This was at approximately 2230 hrs.

The technicians first thought was that the ladder had been borrowed and proceeded to drive to where they thought the person who might have the ladder was working. They found that the person was not working that night and, before they could do anything else, they received a call from the Airfield Duty Manager regarding the ladder that had been found on the runway. Neither technician could explain how the ladder had come out of WV4 and neither had seen or heard anything during their journey from the approach lights to centreline light 104.

When the second aircraft to land reported the presence of something in the touch down zone, ATC requested that an Airfield Safety Unit (ASU) vehicle be prepared to perform a runway inspection. This vehicle was cleared onto the runway immediately behind G-OOBA once it had touched down. The ASU vehicle located the ladder at 2231 hrs. The runway was immediately closed and remained so until after a full runway inspection had been carried out. The runway reopened at 2250 hrs.

The ladder had been on the runway for 37 minutes.

Incident site

Figure 1 shows the position of the ladder as found on the runway. The ladder was removed from the runway by the ASU personnel before being collected by the technicians. The ladder was positioned to the right of the centreline of the runway in use (Runway 33) laying almost parallel with the centreline. It was lying beside touch down zone markings which are 550 m from the runway threshold and 150 m beyond the aiming point markings.

The first two aircraft that landed whilst the ladder was on the runway were Boeing 737-800 (B737). The third aircraft was a Boeing 757-200 (B757). There was no evidence that any of the aircraft had contacted the ladder whilst it was on the runway. The B737 has a smaller distance between its nosewheels and mainwheels. Assuming that the aircraft all landed with their nosewheels astride the centreline of the runway, and using landing gear dimensional data from the B737, this means the ladder was between 0.2 m and 2.29 m from that line.

With landing speeds in excess of 120 kt, an aircraft hitting an object such as the ladder may have resulted in substantial damage. In this case, taking the position of the ladder on the runway into account, and the main and nose landing gear track width, all three aircraft narrowly missed the ladder.

ATC

The *'Manual of Air Traffic Services'* (MATS) contains procedures, instructions and information which form the basis of Air Traffic Services (ATS) within the UK. The manual is divided into two parts. Part 1 contains instructions that apply to all Air Traffic Service Units (ATSU) within the UK, whilst Part 2 contains instructions for a specific ATSU. Part 1 is produced and published by the UK CAA as CAP 493, with Part 2 being produced by the ATSU and approved by the CAA.

MATS Part 1

MATS Part 1 contains no guidance on the frequency of runway inspections. Generally, ATC are not responsible for runway inspections unless specifically nominated. Due to the variations in movement rates, environmental considerations and local conditions responsibility for the setting of policies on runway inspections is delegated to the individual airport operator. The arrangements will be detailed in MATS Part 2.

MATS Part 1 does specify that:

> *'Following any incident, or suspected incident, on a runway involving tyre failure, aircraft structural failure or, in the case of turbine-engined aircraft, engine malfunction, the runway is to be inspected before any other aircraft are allowed to use it.'*

This is the only time a runway inspection is required under MATS Part 1.

MATS Part 2

Birmingham MATS Part 2 valid at the time of the incident was issued on the 1 April 2020. In Section 3, Chapter 3 it contains details of the runway inspection procedures to be used. Runway inspections are the responsibility of the ASU. The manual states that there are to be at least four full runway inspections to be carried out within a 24-hour period. It also states:

> *'A Full Runway Inspection should be undertaken prior to a fixed wing aircraft movement if there hasn't been a fixed wing aircraft movement in the previous 30 minutes.'*

Although MATS Part 2 had not been amended, the ASU had amended this procedure via a Local Operating Procedures notice. This extended the period between aircraft movements to an hour before an inspection was required. This procedural change occurred in 2016 but had not been communicated to ATC and as a result MATS Part 2 had not been amended. It could not be established why this was changed.

Other runway inspections are detailed in MATS Part 2 including foreign object debris (FOD)/ bird inspections, inspections following towed aircraft crossing the runway and special runway inspection procedures (SRIP). This special procedure exists for unusual situations such as when FOD is reported on the runway. The procedure is initiated by ATC. Should a SRIP be requested, no further departures are permitted nor any approaches except aircraft that are inside 4 nm from touchdown until the inspection has been completed. For aircraft inside 4 nm, the controller must ask:

> *'Request your intentions?'*

The question is deliberately open in order not to influence the crew in their decision. In the case of G-OOBA the controller actually asked the crew:

> *"Are you happy to continue"*

To which the crew answered that they were and continued to land on Runway 33.

The visual control tower has a view of the whole manoeuvring area of the airport. At night this view is restricted simply because large parts of the airport, including the runway, are not illuminated by overhead lighting. Figure 13 shows the view from the visual control tower at night. It is clear from the picture that it was not possible for the tower controller to either see the ladder coming off WV4 or to spot it laying on the runway. The approximate area where the ladder was found is highlighted.

Figure 13

View from the visual control tower at night with the approximate area where the ladder was found highlighted

Other information

The CAA provided the investigation with data from the Mandatory Occurrence Reporting (MOR) system. A search of this database for MORs relating to FOD on the runway at UK airports showed only one other event where a ladder was found on a runway. The airport investigation into this concluded that these steps were dropped from a departing aircraft. Other large items found in the runway environs included a pallet and a hay bale from grass cutting. No aircraft damage was reported from any of these large items. The database did show numerous occasions when items from airside engineering and operations were dropped or left on the runways or taxiways, but these were small items such as screwdrivers, wrenches, mobile phones and handheld radios.

The majority of reports were of findings of items either from aircraft or the runway itself. The list also included regular reports of bird and wildlife strikes resulting in the finding of carcases.

The AAIB did investigate a landing aircraft hitting an aircraft towbar which had been dropped on a runway in 2019[2].

Analysis

Following maintenance on approach lights, a ladder had been positioned into WV4 but subsequently fell from the vehicle onto the runway and was not detected for some time. In the intervening period three aircraft landed on the runway.

Footnote

[2] https://www.gov.uk/aaib-reports/aaib-investigation-to-emb-145ep-g-sajk-and-cessna-p210n-g-cdmh (Accessed 29 January 2021)

Taking the position of the ladder on the runway into account, and the main and nose landing gear track width of all three aircraft, each narrowly missed the ladder. Had the ladder been struck by the main or nose landing gear directly on touchdown, it is likely this would cause the break-up of the ladder with a high risk of explosive tyre burst. This would probably have resulted in high energy fragments hitting the aircraft, thus damaging the airframe or exposed vulnerable hydraulic and electrical components in the landing gear bays. A nose landing gear impact would introduce the additional risk of a nose gear collapse and the ingestion of debris into an engine.

Vehicle selection

There were two reasons why the technicians selected WV4 rather than the apparently more suitable WV3 and WV10. Firstly, reliability was a cause for concern amongst the staff with WV3. Secondly, the inconvenience of tools and equipment falling out of WV10 when its doors were opened. WV4 would have been suitable providing the ladder had been held in the rear of the vehicle securely. However, this depended on how the ladder was positioned and secured in the load area. The choice of restraint was therefore significant.

Choice and method of ladder restraint

At first sight the bungee may have seemed suitable to secure the ladder in WV4. However, when the actual method used was demonstrated, it could be seen why the bungee was unsuitable. The bungee had been stretched almost to its limits around a strut on the ladder and hooked to the right and left forward fixed rings in the load bay side panels (Figure 5). When the vehicle is stationary or moving slowly the method used would keep the ladder in place. Any gentle acceleration or moderate cornering would cause the ladder to move, and the remaining elasticity in the bungee would have provided sufficient restraint.

It is likely that as WV4 accelerated, having passed the aiming point markings, the ladder was caused to moved more rapidly, and its inertia resulted in a ‘snatch’ load on the bungee when it reached the limit of elasticity. At this point, the snatch load would have been transferred into the wire hooks fitted to the ends of the bungee. In this case one of the hooks opened out (Figure 7) making it less effective in the restraint ring. As a result it most likely unhooked, rapidly sprang back, and unravelled itself from the ladder strut. This left the now unrestrained ladder to topple rearwards from WV4. As it fell out and contacted the runway it slid a short distance before coming to a stop causing the abrasion to the edges of the plastic at the top of the ladder (Figure 6).

Given the grooved surface of the runway, the noise of the tyres, especially at speed, would have likely masked any sound made by the ladder as it left the truck. Both technicians were also concentrating on checking the runway lights ahead of the vehicle and therefore their attention would not have been focused on monitoring the ladder.

Radio communications

After the landing of the first aircraft (EI-DPC) no comment was made by the crew regarding anything they may have seen in the touch down zone. After the second aircraft (G-GDFR) taxied off the runway the crew commented that they thought they had seen something and

described it as an object or paint. This prompted the crew of the first aircraft to comment that they may also have seen something although they did not give any detail about what they thought they had seen.

Given the comments of the first two aircraft it seems likely that both the controller and the crew of G-OOBA did not believe the item to be of significance. In fact, the overriding impression seemed to be that it was just paint or a marking on the runway.

As G-OOBA was within 4 nm of the threshold, Birmingham MATS Part 2 allowed the controller discretion to permit the aircraft to continue as long as the crew wished to do so. The wording given in the manual was deliberately open to prevent any confirmation bias within the operating crew. The crew of G-OOBA commented that the use of the phrase 'are you happy to continue' re-enforced the impression that there was nothing to be concerned about. This impression, together with the belief that it was probably paint, led to the decision of the crew to continue to land on Runway 33.

When faced with having to make a rapid decision about continuing the approach or going around the language used to convey information to the crew is vital. Had the crew of G-OOBA known there was a ladder on the runway they would have chosen to go around. Had the controller known of the ladder the controller would have instructed the crew of G-OOBA to perform a go-around. However, both the crew and the controller can only act on the information they have at the time.

Having been pre-warned to look for something in the touch down zone, the crew of G-OOBA spotted the object and were able to correctly identify it as a ladder. Given where the crew are concentrating their attention during touchdown and the speed of the aircraft at that point, it would have been difficult for the previous crews to identify the item as a foreign object.

Conclusion

The ladder fell from WV4 during the drive along the runway, at the point where it accelerated in the touch down zone after the end of the supplementary lights. The means of securing the ladder in the rear of the open back vehicle using a bungee was not suitable. The bungee was available for use within the maintenance organisation's facility, but its provenance was not known. More suitable securing equipment was available although not readily to hand.

The airport operator and the CAA have taken several safety actions to prevent reoccurrence.

Safety actions

Airport Operator

In parallel with the AAIB investigation the airport safety staff conducted an investigation and identified several safety actions to reduce the likelihood of this type of event reoccurring. These are summarised under the various headings as follows:

Runway inspections and foreign object debris (FOD)

- Review the airport published procedures regarding runway Inspections
- Review of ATCO immediate actions on receipt of FOD reports.
- Review the airport policy and local operating procedures regarding the FOD monitoring and alerting procedures.
- Define definitive actions to be taken when runway FOD is reported.

Airfield driving

- Undertake review of manoeuvring area and runway (M and R) permit course against the requirements of CAP 790.
- Splitting of the airfield driving permits to authorise M and/or R. This will include R permits issued annually and will include runway incursion awareness training.
- Undertake a review of airfield driving training and permit validity.

Airfield vehicles

- Working Instruction WI-EE-ES-AE-104 issued. Use of WV4. The load area must be kept sterile and clear of materials and tooling to avoid any FOD. Any exceptions to this must be pre-authorised by the Airfield Engineering Supervisor or Senior Airfield Technicians via email. Confirmation should be gained before proceeding with any use.
- Implement an airport vehicle management procedure for all users to include a vehicle FOD inspection procedure.
- Undertake a suitability assessment of all engineering services vehicles used to undertake tasks on the runway and manoeuvring area.

Tool control

- Collaboratively define a common standard of formal tool procedure to be adhered to by all airside users, which includes a tool control safety promotion plan and compliance and audit plan.

Training

- In order to support a Just Culture, identify training to improve knowledge/ improving skills of all airside users (all runway users) to include:
  - Define the Birmingham Airport Just Culture
  - Increased task awareness
  - Ensuring data and information is available
  - Encouraging reporting
- Review learnings at safety meetings including; Airside Safety Committee/Local Runway Safety Team/Flight Safety Committee.
- Develop a training plan for the Engineering Services department to include performance objectives, competence checks and approval process.

Civil Aviation Authority (CAA)

The AAIB were concerned that airport ground staff may not have sight of AAIB reports and publications. Therefore, discussions were held with the CAA to explore how this incident might be brought to the attention of the wider aerodrome ground staff community. Accordingly, the CAA issued a SkyWise notification under Aerodrome Safety Alerts section on 16 October 2020 as follows:

> Runway maintenance – equipment control
>
> A recent incident at a UK aerodrome led to maintenance equipment being left on the runway. This incident is currently subject to AAIB investigation.
>
> It has become apparent that a lack of tool control, and security of equipment carried on aerodrome vehicles were contributory factors.
>
> Aerodrome operators should ensure that:
>
> 1. Procedures for both routine maintenance and work in progress includes robust equipment control
> 2. Suitable vehicles are used for transporting equipment
> 3. Equipment is carried in/on vehicles securely
>
> SW2020/230

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