SERIOUS INCIDENT

Aircraft Type and Registration:	Mooney M20K, G-OSUS	
No & Type of Engines:	1 Teledyne Continental TSIO-360-LB1 piston engine	
Year of Manufacture:	1980 (Serial no: 25-0429)	
Date & Time (UTC):	30 May 2020 at 1255 hrs	
Location:	Membury Airfield, Berkshire	
Type of Flight:	Private	
Persons on Board:	Crew -1	Passengers -1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Damage to baggage door, rear fuselage and tailplane	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	28 years	
Commander's Flying Experience:	165 hrs (of which 50 were on type) Last 90 days - 15 hours Last 28 days - 4 hours	
Information Source:	AAIB Field investigation	

Synopsis

The aircraft was in level flight and had been flying for approximately 15 minutes when the baggage door opened and detached. It struck the right tailplane and remained wrapped round its leading edge near its tip. This caused the pilot control difficulties and increased drag. The pilot declared a MAYDAY and made a successful emergency landing at Membury Airfield.

The investigation found the safety clip for the internal emergency operating handle of the baggage door was not correctly installed, so instead of holding the handle closed it held it in a slightly open position. During the flight, it seems most likely that this handle moved sufficiently towards the open position to disengage the shoot bolts from the door frame allowing the door to open.

It could not be determined when the safety clip was incorrectly installed or why it had not been noticed.

History of the flight

The pilot had flown the aircraft to Charlton Park Airstrip and whilst there the baggage door had been opened from the outside to allow access to a picnic basket. As it was a hot day, It was left open for the duration of the stay to keep the cabin area cool (Figure 1).

Figure 1

G-OSUS being pushed into a parking position showing open baggage door

Before departure the baggage area was repacked, and the pilot checked the baggage door was securely closed from the outside. Once seated the pilot visually checked the internal handle from his seat and it appeared closed.

The takeoff and climb to cruise altitude was without incident. The weather was good and there was some thermal activity causing light turbulence at times. Approximately 15 minutes into the flight, and just after the aircraft had passed overhead Membury Airfield, Berkshire, there was a loud bang and the aircraft pitched nose-down and rolled to the right. The baggage door had opened and detached. It had struck and remained attached to the right tailplane leading edge near its right tip (Figure 2). The pilot was able to control the aircraft and then declared a MAYDAY whilst he positioned to land at Membury Airfield. During the approach the pilot maintained a higher speed than normal due to the control difficulties and landed on Runway 13, which is 1,000 m long. During the extended ground roll, due to the higher than normal touchdown speed, the pilot steered the aircraft right into a clear space on the airfield and stopped without further incident.

Figure 2

Baggage door on the tailplane right tip, as found after landing, looking forward

Aircraft information

The Mooney M20K is a single engine, four seat light aircraft of primarily metal construction. A baggage door is fitted to allow access to the baggage area behind the rear row of seats. It is hinged at the top and secured at the bottom with two shoot bolts, these extend fore and aft into fittings in the door frame when the operating handle is closed; this handle can also be locked for security. The door also serves as an auxiliary exit and is fitted with an internal emergency handle to allow operation from inside the aircraft. The internal emergency handle will open the door even if the external handle is locked.

The internal emergency handle is fitted with a secondary locking clip to prevent inadvertent operation and there is a cover over the whole mechanism along with a placard providing operating instructions (Figure 3). This secondary locking clip was introduced by the manufacturer in a service bulletin (SB) SB M20-239A, issued in 1988 and mandated by Airworthiness Directive (AD) 88-25-11 which became effective 5 January 1989. This aircraft had this SB/AD embodied.

Figure 3

Internal emergency handle correctly closed and secured by secondary locking clip
(Image shows accident door, placard and cover are missing)

Aircraft examination

The aircraft sustained considerable damage to the right side of the tailplane. The force of the impact twisted the right side of the tailplane rearwards and the left side forwards to such an extent that it was touching the fuselage where normally there is a gap. Several rivets around the tail assembly attachment to the fuselage were 'popped'.

The baggage door was inspected by the AAIB after it had been removed from the tailplane. Photographs taken before the flight and immediately after landing were also studied. These examinations confirmed the positions of the operating handles and other related components.

Closer examination and magnification of Figure 1 shows that the internal handle was in a partly open position before the flight (Figure 4). The image is grainy due to the magnification and the contrast and colour have been adjusted to show the handle more clearly. The image has been rotated 180° to align more with the image in Figure 5, which shows the similar position of the internal operating handle after landing, for comparison.

Figure 4

Extract of Figure 1 showing internal operating handle partially open before flight

Figure 5

Position of internal operating handle after emergency landing

The internal handle features a slot which allows the handle to be opened partly before it starts to move the shoot bolts from the fully extended position. The handle position in the images taken before and after the flight (Figures 4 and 5), show the internal handle approximately in a position where the shoot bolts would not yet have moved and they can be seen extended.

The internal handle had the secondary locking clip installed in the clevis pin, but this was installed under the handle rather than over it, so it did not provide a secondary locking feature. The locking clip is also bent suggesting the handle had been forced down on to the locking clip onto the locking clip (Figure 6). This may have made it appear as though the operating handle was in the correct closed position.

Closer inspection of the clevis pin found that it was loose in its mounting plate rather than the push fit specified. This meant that it was free to drop down which made it impossible to install the locking clip until it had been lifted to the correct position.

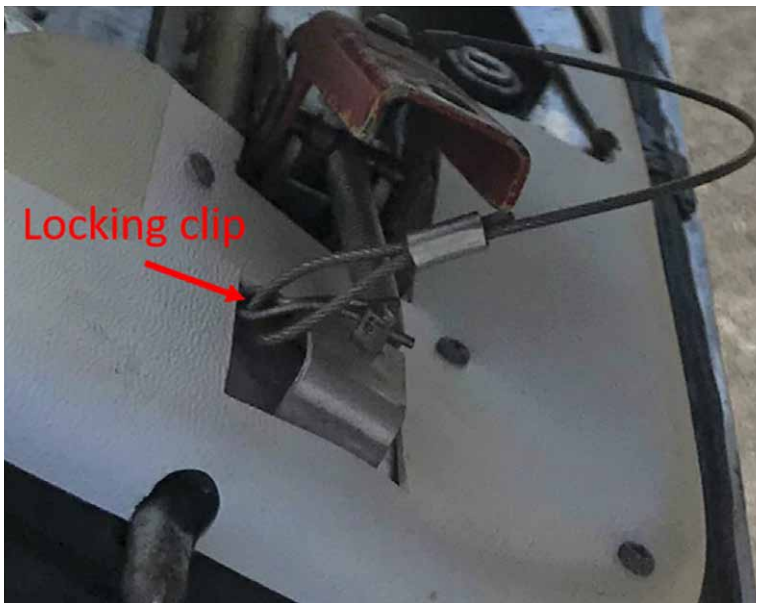

Figure 6

Bent locking clip and partially open internal handle

Personnel

The pilot was correctly licenced to operate this aircraft and since gaining a PPL has voluntarily spent extra time with an instructor practising dealing with various emergency situations, including forced landings. The pilot stated this extra training proved invaluable in this event. The pilot also stated that they had not touched the internal handle since the recent maintenance. This was the fourth flight since then, and the pilot had not had the need to open the baggage door from the inside. He had not seen a plastic cover over the handle at any time.

Maintenance information

In 2019, the aircraft was repainted and in addition to the external paint finish, the internal plastic trim panels were also painted. In order to remove the plastic trim panel from the baggage door, the internal operating handle would have been opened to release the trim panel. On completion of the painting the interior trim panels were certified as being correctly fitted; there was no separate item in the work pack for refitting the baggage door internal emergency operating handle or its cover. The whole work pack for the repaint was certified as complete on 11 September 2019.

The aircraft had undergone other maintenance checks and been flown by several other pilots since the repaint. During the most recent maintenance, an Annual Inspection and Airworthiness Review, completed on 29 May 2020, an 'operational check'[1] of the 'Doors, hatches and windows latching and locking' had been certified as being completed.

Other information

The pilot's operating handbook used by the pilot required in item 10 of the pre-flight check list '*Baggage door – Secure*'. A version supplied by the maintenance organisation for the same item 10 stated '*Baggage door – SECURE and lock before flight*'. Both documents are marked as Revision A. Whether or not the external handle was locked, operation of the internal emergency handle would still open the door.

Analysis

An image taken at Charlton Park before the incident flight, showed that the internal baggage door handle was partially open when the aircraft was parked. It appeared to be in a position where the extension of the shoot bolts would not be affected. Before departure the pilot checked that the baggage door was properly closed, physically from the outside and visually on the inside from his seat but did not see the internal handle was not properly closed. Normal operation of the baggage door is by use of the external handle and this was the only handle that the pilot used.

Inspection of the internal emergency handle showed that it had been incorrectly assembled; the safety clip was fitted under the operating handle rather than above it. The safety clip appeared to be bent, possibly as a result of the operating handle being forced into its closed position over it. This meant the handle was not in the fully closed position and it would have been held slightly open by the safety clip, although the available images suggest it had moved further open than this.

It was not possible to determine exactly when this internal handle and its safety clip was incorrectly installed. They were disassembled, to allow removal and refitting of the trim panel for repainting, in 2019. Since then, the aircraft had undergone maintenance checks and had been flown by several pilots. During the most recent maintenance a check of the

Footnote

[1] An 'operational check' is a test used to determine that a system or component or any function thereof is operating normally.

baggage door's correct latching and locking had been certified. Since this maintenance, the aircraft had flown three flights before the incident flight.

Before the flight the pilot had loaded the baggage bay and it is possible that, in the light turbulence experienced during the flight, something shifted and moved the handle to a more open position causing the shoot bolts to disengage. However, this would not explain why the internal handle and safety clip were not properly installed.

Conclusion

The safety clip for the internal operating handle of the baggage door was not correctly installed, so instead of holding the handle closed it held it slightly towards the open position. During flight it seems most likely that this handle moved further open, and sufficiently far to disengage the shoot bolts from the door frame, allowing the door to open. The force of the airflow then detached the door and it struck and became jammed on the tailplane.

It could not be determined when the internal handle and its safety clip were incorrectly installed or why this or the partially open internal handle had not been noticed.

Despite the baggage door jamming on the tailplane, the pilot had sufficient control to allow a safe landing. The pilot maintained a higher speed than normal to ensure the aircraft remained controllable. The pilot attributes the successful outcome to the voluntary additional training undertaken to practise dealing with emergencies.

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