



National Transportation Safety Board

Washington, D.C. 20594
Safety Recommendation

Log 1997

Date: April 26, 1988

In reply refer to: A-88-51 through-54

Honorable T. Allan McArtor
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On June 14, 1987, a Mooney Aircraft Corporation (Mooney) model M20K (231), N4047H, crashed at the Jefferson County Airport, Broomfield, Colorado, 1/ after the airplane's baggage door popped open during takeoff. Two of the three persons aboard the airplane were killed; the third person was injured seriously. Witnesses reported seeing the airplane's baggage door open during the takeoff roll. After takeoff, at an altitude of about 100 feet, the airplane was observed to pitch up and roll toward the left to a near vertical bank before crashing. The baggage door was found near the wreckage with the exterior handle in the closed and locked position and the interior handle unlatched.

On September 24, 1983, a Mooney model M20F (Executive), N9464V, was involved in a similar crash as a result of an open baggage door. This airplane crashed just after takeoff from the Salt Lake International Airport, Salt Lake City, Utah, 2/ killing all three persons aboard. Additionally, since 1983, according to Service Difficulty Reports (SDR) submitted to the Federal Aviation Administration (FAA), baggage doors similar to those installed on N4047H have also opened in flight on two Mooney M20J (201) models and one M20K (231) model. Comments from the SDRs state:

- o On 8/11/86, the baggage door (locked) came open in flight with damage to the door and adjacent aluminum skin, when a passenger in the rear seat reclined her seat back. Plastic cover over the inside red latch had fallen off, allowing the red handle to hang down slightly when the door was closed from the outside. This allowed it to be struck by the reclining seat back. Plastic cover should be secured by washers under the screws holding it in place (service bulletin) or the inside red emergency latch should be redesigned.
- o The submitter stated that on three separate occasions, the baggage door came open during flight, although securely closed and locked. It appears that the locking pins do not engage far enough into the frame.
- o Baggage door popped open during descent from 5000 ft.

1/ For more detailed information, read Field Accident Brief No. 906 (attached).

2/ For more detailed information, read Field Accident Brief No. 2365 (attached).

According to Mooney, it has not conducted any tests to determine the precise aerodynamic effects of an open baggage door on airplane controllability. Mooney contends that there have been a sufficient number of occurrences of M20 baggage doors opening in flight, wherein the airplane was subsequently flown without incident, to indicate that flight characteristics are not adversely affected. Whether such a categorical assertion is valid for all conditions and phases of flight may remain subject to further technical evaluation. However, regardless of the effect on controllability, the Safety Board believes that an in-flight opening of a baggage door is always hazardous because of the potential for structural damage and the substantial pilot distraction that is created, particularly during takeoff.

The design of the baggage compartment doors is similar on all Mooney M20 series airplanes except for the M20J and M20K models. The baggage compartment doors on the latter models also serve as auxiliary exits and, therefore, have latching handles on the interior as well as the exterior of the doors. Both handles operate independently of the other; that is, the baggage door may be opened using the interior handle while the exterior handle remains in the closed and locked position. However, because of the mechanical design of the latching mechanism, only the exterior handle should normally be used to close and latch the door. Otherwise, the baggage door may remain unlatched and may open in flight even with both handles in the closed position. This occurs because after demonstration or use of the interior auxiliary handle, the latch mechanism clevis pin may not properly engage the outside handle cam assembly.

After receiving reports of baggage doors opening in flight as a result of this condition, Mooney, on April 12, 1983, issued Service Instruction M20-63, "Engagement of Baggage Door Auxiliary Exit Latching Mechanism," applicable to the M20J and the M20K models. The service instruction provided for spring loading the clevis pin to ensure its positive engagement in the outside handle cam slot whenever the interior auxiliary exit handle is activated. This modification had been incorporated on N4047H and, therefore, the potential problem of an open baggage door due specifically to improper engagement of the latch mechanism clevis pin does not appear relevant to this particular accident. However, the accidents involving N4047H and N9464V dramatically illustrate the potential hazards of an open baggage door in flight and emphasize the need to eliminate any design factors that may lead to such a condition. Therefore, the Safety Board believes that the FAA should issue an airworthiness directive requiring compliance with Service Instruction M20-63.

Notwithstanding the design modification afforded by compliance with Service Instruction M20-63, both the interior and exterior baggage door handles should be closed and secured (outside handle locked, inside handle "snapped" shut) to ensure that the baggage door does not open during the takeoff or flight due to vibration and/or airloads. The interior handle has a plastic plunger-type knob and grommet, which enables it to be snapped into and secured to a metal clip. The knob has four locking teeth that secure or release it from the metal clip when the plunger is pushed or pulled, respectively. The handle is covered by a small, easily removable plastic cover.

The design of the interior handle assembly itself does not appear to be particularly durable and, after some nominal period of service, may not be adequate to ensure that the handle remains in the closed-snapped shut position. For example, some of the plastic locking teeth were missing on the knob installed in N4047H, as well as on the knobs installed in several other Mooney airplanes examined by the Safety Board. This

condition could result in the handle popping open because of vibration and/or use of a rough runway surface. Also, the cover for the handle assembly in N4047H was found under the rear seat of the airplane, and the covers on several other similar airplanes examined by the Board were found lying on the baggage compartment floors. With the cover off, the handle is subject to possible disengagement from the metal clip, particularly if any locking teeth are missing. This could occur as a result of passenger activity; snagging of the handle by the right, rear shoulder harness; bumping/forceful contact with baggage as the baggage door is closed; or, when the high seatbacks installed on later M20K airplanes are reclined. As a result, the Safety Board believes that the FAA should require Mooney to further modify the design of the auxiliary exit (interior) handle/cover assembly. The modification should enhance the durability of the assembly to help ensure that the handle will not inadvertently open or actuate.

A closed and locked exterior baggage door handle on Mooney model M20J and M20K airplanes can be misleading, as regards the security of the baggage door itself, since the interior handle, if unsecured, may allow the baggage door to open in flight. Therefore, the pilots of these airplanes must ensure, during preflight inspection, that both handles are closed and secured. However, the position of the interior handle, which is not discernible from the exterior of the airplane, is not included as a checklist item in the M20J or M20K pilot operating handbooks (POH). Moreover, none of the POHs for Mooney M20 series airplanes addresses the possibility of an inadvertent opening of the baggage door in flight nor provides any information as to the action a pilot should take to minimize the potential hazards of such an occurrence. As a result, the Safety Board believes that the FAA should require Mooney to amend M20J and M20K preflight checklists and revise the POHs for all Mooney M20 series airplanes accordingly.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Issue an airworthiness directive applicable to Mooney M20J airplanes, serial numbers 24-0084 and 24-0378 through 24-1381, and to Mooney M20K airplanes, serial numbers 25-0001 through 25-0754, requiring at the next annual or 100-hour inspection, whichever occurs first, compliance with Mooney Service Instruction M20-63, "Engagement of Baggage Door Auxiliary Exit Latching Mechanism." (Class II, Priority Action) (A-88-51)

Require the Mooney Aircraft Corporation to develop a modification of the design of the auxiliary exit handle/cover assemblies installed in M20J and M20K airplanes to enhance the durability of these assemblies and ensure that the handle will not inadvertently open or actuate. The modification should be installed on newly manufactured airplanes and be suitable for retrofit on existing models. (Class II, Priority Action) (A-88-52)

When the retrofit modification parts for the auxiliary exit handle/cover assemblies are available, issue an airworthiness directive requiring that they be installed on all M20J and M20K airplanes at the next annual or 100-hour inspection, whichever occurs first. (Class II, Priority Action) (A-88-53)

Require the Mooney Aircraft Corporation to include on all preflight checklists applicable to M20J and M20K airplanes a reference to, and instructions for checking, the auxiliary exit handle/cover assembly. The possibility of a baggage door opening in flight, particularly during the critical takeoff and landing phases, and the specific actions a pilot should take to minimize the potential hazards of such an occurrence, should be discussed in pilot operating handbooks (POH) applicable to all Mooney M20 series airplanes. Revisions to checklists and POHs, as appropriate, should be mailed directly to all owner/operators of these airplanes. (Class II, Priority Action) (A-88-54)

BURNETT, Chairman, KOLSTAD, Vice Chairman, and LAUBER and NALL, Members, concurred in these recommendations.


By: Jim Burnett
Chairman

Brief of Accident

File No. - 2365 9/24/83 SALT LAKE CITY, UT A/C Reg. No. N9464V Time (Lcl) - 0711 MDT

-----Basic Information-----
Type Operating Certificate-NONE (GENERAL AVIATION)

Type of Operation -PERSONAL
Flight Conducted Under -14 CFR 91
Accident Occurred During -DESCENT

Aircraft Damage
DESTROYED
Fire
ON GROUND
Crew
Pass
Fatal Serious Minor None
1 0 0 0
2 0 0 0

-----Aircraft Information-----

Make/Model - MOONEY M20F
Landing Gear - TRICYCLE-RETRACTABLE
Max Gross Wt - 2740
No. of Seats - 4

ELT Installed/Activated - YES/NO
Stall Warning System - YES

-----Environment/Operations Information-----

Weather Data
Wx Briefing - FSS
Method - IN PERSON
Completeness - WEATHER NOT PERTINENT
Basic Weather - VMC
Wind Dir/Speed- 170/006 KTS
Visibility - 30.0 SM
Lowest Sky/Clouds - CLEAR
Lowest Ceiling - NONE
Obstructions to Vision- NONE
Precipitation - NONE
Condition of Light - DAYLIGHT

Itinerary
Last Departure Point
SAME AS ACC/INC
Destination
LAKE HAVASU, AZ

ATC/Airspace
Type of Flight Plan - VFR
Type of Clearance - NONE
Type Apch/Lnds - NONE

Airport Proximity
OFF AIRPORT/STRIP

Airport Data
SALT LAKE CITY INTL
Runway Ident - 34R
Runway Lth/Wid - 9596/ 150
Runway Surface - ASPHALT
Runway Status - DRY

-----Personnel Information-----

Pilot-In-Command
Certificate(s)/Rating(s)
PRIVATE
SE LAND

Age - 58
Biennial Flight Review
Current - YES
Months Since - 9
Aircraft Type - 152

Medical Certificate - VALID MEDICAL-WAIVERS/LIMIT
Flight Time (Hours)
Total - 794 Last 24 Hrs - UNK/NR
Make/Model- 159 Last 30 Days- 4
Instrument- 19 Last 90 Days- 10

Instrument Rating(s) - NONE

-----Narrative-----

THE ACFT CRASHED IN AN UNCONTROLLED DESCENT SHORTLY AFTER TAKEOFF. A WITNESS NOTICED THE ACFT IN A TAIL LOW ATTITUDE AT LOW ALT AND SLOW AIRSPEED. HE SAID THE PLANE LOOKED LIKE IT WAS SHIFTING FROM SIDE TO SIDE. THE LEFT WING DIPPED. THE ACFT ROLLED TO THE RIGHT AND DIVED TO THE GROUND. POST ACCIDENT EXAMINATION FOUND NOTHING OUT OF THE ORDINARY EXCEPT THAT THE BAGGAGE DOOR LOCKING PINS WERE UNLATCHED. THE LATCHING MECHANISM WAS CAPABLE OF OPERATION, THERE WERE NO RADIO CALLS TO INDICATE TROUBLE. HOWEVER THE PLT DID NOT ACKNOWLEDGE OR COMPLY WITH THE TOWER CALL AFTER TAKEOFF TO TURN RIGHT CONTACT DEPARTURE. THE ACFT CRASHED ONE MINUTE LATER.

Brief of Accident (Continued)

File No. - 2365 9/24/83 SALT LAKE CITY, UT A/C Reg. No. N9464V Time (Lcl) - 0711 MDT

Occurrence #1 LOSS OF CONTROL - IN FLIGHT
Phase of Operation TAKEOFF - INITIAL CLIMB

- Findings(s)
1. DOOR, CARGO - LOOSE
 2. AIRSPEED - NOT MAINTAINED - PILOT IN COMMAND
 3. IMPROPER USE OF EQUIPMENT/AIRCRAFT, DIVERTED ATTENTION - PILOT IN COMMAND
 4. STALL - INADVERTENT - PILOT IN COMMAND

Occurrence #2 IN FLIGHT COLLISION WITH TERRAIN
Phase of Operation DESCENT - UNCONTROLLED

-----Probable Cause-----

The National Transportation Safety Board determines that the Probable Cause(s) of this accident is/are findings(s) 2,3,4

Factor(s) relating to this accident is/are findings(s) 1

Brief of Accident

File No. - 906 6/14/87 BROOMFIELD, CO A/C Reg. No. N4047H Time (Lcl) - 1136 MDT

---Basic Information---
 Type Operating Certificate-NONE (GENERAL AVIATION)
 Aircraft Damage DESTROYED
 Fire NONE
 Fatal 1
 Serious 0
 Minor 0
 Injuries None
 Crew 1
 Pass 0
 Type of Operation -PERSONAL
 Flight Conducted Under -14 CFR 91
 Accident Occurred During -TAKEOFF

---Aircraft Information---
 Make/Model - MOONEY M20K
 Landing Gear - TRICYCLE-RETRACTABLE
 Max Gross Wt - 2900
 No. of Seats - 4
 Eng Make/Model - CONTINENTAL TS10-360-GB1 ELT Installed/Activated - YES/YES
 Number Engines - 1 Stall Warning System - YES
 Engine Type - RECIP-FUEL INJECTED
 Rated Power - 210 HP

---Environment/Operations Information---
 Weather Data
 Mx Briefings - NO RECORD OF BRIEFING
 Method - N/A
 Completeness - N/A
 Basic Weather - VMC
 Wind Dir/Speed- 290/005 KTS
 Visibility - 60.0 SM
 Lowest Sky/Clouds - 4000 FT SCATTERED
 Lowest Ceiling - 6000 FT BROKEN
 Obstructions to Vision- NONE
 Precipitation - NONE
 Condition of Light - DAYLIGHT
 Itinerary
 Last Departure Point
 SAME AS ACC/INC
 Destination
 LOCAL
 ATC/Airspace
 Type of Flight Plan - NONE
 Type of Clearance - NONE
 Type Apch/Lnds - NONE
 Airport Proximity
 ON AIRPORT
 Airport Data
 JEFFERSON COUNTY
 Runway Ident - 29R
 Runway Lth/Wid - 9000/ 100
 Runway Surface - ASPHALT
 Runway Status - DRY

---Personnel Information---
 Pilot-In-Command
 Certificate(s)/Ratings(s)
 PRIVATE
 SE LAND
 Age - 60
 Biennial Flight Review
 Current - YES
 Months Since - 19
 Aircraft Type - PA-28
 Medical Certificate - VALID MEDICAL-WAIVERS/LIMIT
 Flight Time (Hours)
 Total - 324
 Make/Model- 14
 Instrument- 46
 Last 24 Hrs - UNK/NR
 Last 30 Days- 5
 Last 90 Days- 8

Instrument Rating(s) - AIRPLANE
 ---Narrative---
 DRG TAKEOFF, THE BAGGAGE DOOR (BD) CAME OPEN. TWR PSNL ADVISED THE PLT, BUT RECD NO DISCERNIBLE REPLY. AT APRX 100' AGL, THE ACFT PITCHED UP & ROLLED LEFT, THEN ENTERED A STEEP DESCNT & CRASHED APRX 500' LEFT OF THE RWY, EXCEPT FOR THE BD, NO PREIMPACT MECH PRBLM WAS FND. THE BD WAS FND SEPD FK THE FUSELAGE WITH THE EXTERNAL LEVER (EXT LVR) SEATED & LOCKED, BUT THE INTERNAL LEVER (INT LVR) WAS DISPLACED TWD THE OPEN PSN & THE PROTECTIVE COVER (CVR) FOR THE INT LVR WAS FND INSIDE THE ACFT. ALSO, THE INT LVR LOCK KNOB WAS MISSING 2 OF 4 LOCKING EARS. NORMALLY, THE BD IS TO BE OPENED & CLOSED BY USING THE EXT LVR & THE INT LVR IS INTENDED TO BE ACTUATED ONLY WHEN THE BD IS USED AS AN AUX (EMERGENCY) EXIT. HOWEVER, WITH THE CVR OFF, THE INT LVR WAS VULNERABLE TO POSSIBLE MOVEMENT BY UNWARRANTED PAX ACTIVITY, INTERFERENCE WITH REAR SHOULDER HARNESS, OR INADVERTENT CONTACT WITH BAGGAGE OR RECLINING REAR SEAT. THE FLT MANUAL DOES NOT ADDRESS THE POSSIBILITY OF THE BD COMING OPEN IN FLT. ALSO, THE INT LVR IS NOT LISTED AS AN ITEM ON THE PREFLT CHECKLIST.

Brief of Accident (Continued)

File No. - 906 6/14/87 BROOKFIELD, CO A/C Reg. No. N4047H Time (Lcl) - 1136 MDT

Occurrence #1 AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation TAKEOFF - INITIAL CLIMB

Findings(s)

1. DOOR, CARGO - LOOSE
2. AIRCRAFT PREFLIGHT - INADEQUATE -
3. AIRCRAFT/EQUIPMENT, INADEQUATE DESIGN - PRODUCTION/DESIGN PSNL
4. AIRCRAFT/EQUIPMENT, INADEQUATE DESIGN (STANDARD/REQUIREMENT), AIRCRAFT MANUALS - MANUFACTURER

Occurrence #2 LOSS OF CONTROL - IN FLIGHT
Phase of Operation TAKEOFF - INITIAL CLIMB

Findings(s)

5. DOOR, CARGO - OPEN

Occurrence #3 IN FLIGHT COLLISION WITH TERRAIN
Phase of Operation TAKEOFF

Probable Cause

The National Transportation Safety Board determines that the Probable Cause(s) of this accident is/are findings(s) 1,2,3,4,5