No: 4/92 **Ref: EW/C91/12/1** **Category: 1a**

Aircraft Type and Registration:	McDonnell Douglas MD-83, SE-DHC
No & Type of Engines:	2 Pratt and Whitney JT8D-219 turbofan engines
Year of Manufacture:	1987
Date & Time (UTC):	11 December 1991 at 1449 hrs
Location:	London Gatwick Airport
Type of Flight:	Public Transport
Persons on Board:	Crew - 6 Passengers - 31
Injuries:	Crew - None Passengers - None
Nature of Damage:	Minor distortion and scoring of ejected tailcone, failure of slide-deployment lanyard
Commander's Licence:	Swedish Airline Transport Pilot's Licence
Commander's Age:	36 years
Commander's Flying Experience:	7,400 hours (of which 3,000 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot

History of the Flight

On 9 December 1991, two days before the accident flight, the tailcone of the aircraft was inadvertently jettisoned by a member of the cabin crew. The tailcone, which had suffered only minor damage, was refitted and the aircraft returned to service. It then operated a further four sectors before departing Stockholm for London Gatwick on 11 December 1991. During the flight to Gatwick, the aircraft experienced no turbulence and, following an ILS approach to runway 08 Right, made a normal touch down some 35,000 lbs below maximum landing weight. After touch down, reverse idle thrust was selected and the aircraft completed its landing roll without incident. On clearing the runway, the crew were informed by ATC that the tailcone of their aircraft had detached on landing. The crew then noticed that the 'Tailcone' light in the overhead panel was illuminated. The aircraft continued to its stand and the passengers were disembarked in the normal manner.

Flight Recorders

The FDR fitted was a Sundstrand Digital Flight Data Recorder with a 25 hour recycling metal tape, a total of 36 analogue and 39 discrete parameters were recorded. A satisfactory replay was obtained.

The CVR was not removed as the 30 minute recycling tape would have overwritten the approach and landing.

The approach appeared normal with a speed of 120 kt Calibrated Air Speed at the threshold (Vref 119 kt), and a speed of 111 kt at touchdown. The maximum pitch attitude during the flare was 4.5°. The touchdown was smooth with a maximum normal acceleration of 1.1 g, reverse idle was selected five seconds after touchdown.

Description of Rear Cabin Door and Escape System

The MD 83 is designed in such a way as to enable both normal and emergency evacuation to be effected through the exit door in the aft pressure bulkhead. This door opens inwards and is secured in the closed position by shoot-bolts. In normal operation the door permits passengers to leave via a retractable ventral staircase.

Under emergency conditions however, the staircase remains in the retracted position and the tailcone is ejected, allowing passengers to leave the aircraft via the bulkhead door and down an escape slide mounted in the aperture revealed by the absence of the tailcone.

The tailcone is secured by means of four lockpins mounted on the aperture frame. These lockpins rotate to engage or disengage the tailcone. Rotation is achieved by means of levers mounted on the lockpin shafts, which are turned by a system of cables working over pulleys. The cable system is linked to two operating handles in the rear of the fuselage and to a semi-rigid cable link to the area of the passenger door in the pressure bulkhead. This latter cable connects with a release crank mounted above the bulkhead door.

The tailcone may be ejected by one of two principal methods as follows:-

1) Operation of a recessed handle mounted externally on the lower rear fuselage.
2) Automatically by operation of the inward opening bulkhead door, provided the escape system is in the 'armed' condition.

(Release of the cone is also available by operation of a backup system, using a handle within the unpressurized area of the rear fuselage, aft of the retractable staircase, once access has been gained to this area and if the automatic release of the tailcone has not already occurred).

The escape system is armed by moving down a hinged flap on the cabin side of the bulkhead door and latching it so as to cover the normal exit handle and thereby reveal a pull-off shield. Once this shield is removed, the emergency handle is exposed. Operation of the emergency handle retracts the door shoot bolts permitting the door to be opened. In addition to this normal operation, movement of the handle also causes an arming rod to project vertically from the top of the door.

Initial opening of the door using the emergency handle causes this exposed arming rod to engage behind the release crank. (This latter component takes the form of a spring-loaded over-centre lever, mounted just above the door aperture, beneath the trim and covered by a hinged flap in the trim). Progressive door movement then causes this crank to spring to the fully forward position, in the process operating the semi rigid cable which, via a series of further cables and pulleys, rotates the four lockpins securing the tailcone. The action of the tailcone falling away pulls a lanyard which operates the escape slide, permitting the passengers to slide to safety.

When the system is not armed the hinged flap is latched in the 'up' position revealing the normal operating handle of the door. This handle operates the shoot bolts in the same way as does the emergency handle but it leaves the arming rod in the retracted position.

Examination of Aircraft

Examination of the tailcone and the locating lockpins showed that all four of the latter had rotated to the correct position for release of the tailcone. The internal and external handles were still stowed but the cables they operate were slack.

The release crank above the cabin door was in the forward or 'operated' position, projecting through the hinged flap in the trim. The cable from the lever to the loop connecting the lockpin levers was tight.

Conversation with the crew and examination of the technical log revealed that the tailcone had been inadvertently released whilst the aircraft was on the ground at Funchal. The system was then reset and the aircraft flew five sectors before this incident occurred.

During attempts to re-set the release crank after the incident at Gatwick it became clear that it could not be positioned correctly, *ie* in such a position that the specified clearance existed between it and the projected arming rod. Further investigation indicated that the crank was only able to move to a position where it was 'on centres', *ie* the spring was not able to cause it to move firmly to the fully aft 'over-centre' position but it remained approximately 1 cm clear of its stop. The position occupied by the crank after this attempt to stow it was thus one in which only very gentle finger-pressure was required to cause it to spring forward to the fully released position.

Further examination revealed that the movement of the crank was restricted by the presence of a nut-plate mounted on the structure of the door aperture, and protruding upwards sufficiently to obstruct the final 1 cm of the crank's movement. It was evident that this nut-plate was not a standard component, nor was there normally any form of attachment at this point on the structure.

It was noted, however, that the the trim was damaged locally in such a way that part of it would have been free to droop down in the area of the top of the door, possibly obstructing the latter. It was evident that a local modification had been carried out at some time to introduce a bolt and nut-plate by drilling appropriate holes in the trim and the door aperture edge member, thereby enabling part of the damaged trim to be secured.

Although the ejection of the tailcone should cause the escape slide to deploy automatically, it is understood that this only occurs if the tailcone separates when the aircraft is stationary. In the incident in question, separation is thought to have occurred at about the time reverse thrust was initiated. In this situation, the operating lanyard normally breaks, preventing the slide bottle from being fired. This appears to have happened on this occasion.