

## Survivability of Martinair crash MP595 in Faro

The investigation report describes, conform the ICAO report format, in three paragraphs effects on seats and occupants: 1.12.5 *Cabin interior*, 1.15.1 *Survivability* (see next two pages) and 2.6 *Survivability of the occupants*.



**View of the rolled over and broken off front part of the crashed *Anthony Ruys***

In April 2000 the British Civil Aviation Authority published the report *Benefit Analysis for Aircraft 16-g Dynamic Seats*

### **EXECUTIVE SUMMARY**

*The objective of this study was to assess the number of serious injuries and fatalities that might have been avoided from the use of 16-g dynamic seats during the period of 1984 to 1998 for survivable accidents involving transport category aircraft operating under 14 CFR Part 121.*

### **From this report, on the Martinair crash in Faro**

Seat rows 11 to 19 - This section corresponds to the transverse rupture of the cabin due to the longitudinal twisting moment of the fuselage.

This section of the fuselage was transversally ruptured due to the explosion (in scenario 5) and/or the longitudinal twisting moment of the fuselage, while the aircraft was off the runway.

Statements (in the form of questionnaires) from the surviving passengers indicated that most of the seats did not resist the impact, hence a large number of occupants in this section were ejected during the impact sequence. Only about eight seriously injured passengers said that their seats had survived the impact. Some passengers reported that they were hit by loose objects, including broken seats. The majority of serious injuries sustained by occupants in this section were fractured bones and internal lesions.

Therefore, it is assessed that introducing 16-g seats would have altered the injury pattern in this scenario. The low assessment is that all six fatally injured passengers would be saved with 16-g seats. However, they would still be seriously injured by the impact. All of the seriously injured passengers, except for the in-lap infant in 17C and the eight passengers, whose seats resisted the impact, would have been reduced to minor or no injuries.

The high assessment assumes no reduction in fatalities and injuries to the occupants. The median assessment is taken as the average of the high and the low assessments.

## 1 .15.1 Survivability (1/2)

**From NON-OFFICIAL TRANSLATION, Page 72 – 74**

**In case of conflicting text, the Portuguese report is the valid document**

The aircraft had a cabin version with 41 rows and a total of 334 seats. There were 327 passengers on board aged between 3 months and 74 years.

The crew consisted of 13 persons, three cockpitcrew and 10 cabincrew.

After the impact the fuselage broke in two distinct parts that according to the structural damage, determined four different zones of injury in the cabin.

The forward section consisting of rows 1 to 10 and the cockpit that corresponds to part of the aircraft which did not catch fire after the impact was immobilized with the left side lying on the ground. In this section were seated 56 passengers, four cabin crew and three cockpit crew.

They all left the aircraft through ruptures in the fuselage, either by themselves or with the help of other passengers.

The two left exits in this zone, 11 and 12, were inoperative because they were in contact with the ground, not permitting its utilization.

The other two, 21 and 22, were not used because they were difficult to reach since they were practically vertical above.

Among the 56 passengers there were no fatalities. There was one serious burned and one mild burn victim, 16 seriously injured (fractures, different internal injuries) and 23 minor injuries (bruises).

The captain and one of the cabin crew sustained minor injuries . The copilot and another cabin crew serious injuries.

In a second section, Forward intermediate, seatrow 11 to 19, there were 73 passengers and two cabin crew.

In this zone was the transversial rupture that completely broke the aft part of the aircraft from the front part.

The passengers situated in that area left exclusively by the holes in the fuselage, either by themselves or being ejected or assisted out.

This situation existed in 20 - 25 % of the cases.

From the above passengers there were 6 fatalities, two mild burned, 26 serious injuries (mainly with fractures) and 28 minor injuries.

One of the cabin crew suffered minor injuries.

This section was the one sustaining more serious injuries of traumatic origin, probably in direct association with the rupture of the fuselage, the observed mortality essentially being due to cranial or spinal injuries.

## 1 .15.1 Survivability (2/2)

**From NON-OFFICIAL TRANSLATION, Page 72 – 74**

**In case of conflicting text, the Portuguese report is the valid document**

The section referred to as AFT intermediate included rows 20 to 29.

There were seated 92 passengers and 2 cabin crew.

This section, located over the integral fuel tanks, was severely damaged by fire, that penetrated the cabin at the moment of impact and propagated into its interior transversally from right to left.

Survivability in this zone was very much affected by the explosion of fuel tanks and subsequent fire, being admissible that there was some kind of previous partial incapacity (loss of consciousness, fractures) from the fatalities, in a way that they did not have the chance to evacuate in time.

We had 48 fatalities among the passengers and also the two cabin crew in this section. This number corresponds to 89% of the fatalities. Of these, the majority met death by carbonization and some by cranial traumatias.

Although it was not possible to determine in the majority of the cases evidence of post-impact survivability, this is admissible, although not quantifiable, due to the documented evidence of elevated levels of carboxihemoglobin.

From the other passengers in this section 37 (84% of the survivors) suffered serious injury or burns, having left the aircraft in the majority by holes in the fuselage or through the cabin floor or being assisted by other people to the outside (52%).

The two passengers in seats 24A and 24B left the aircraft using emergency exit 13, which door had been projected out at the time of impact.

Both suffered extensive and serious burns.

Survivors from rows 28 and 29 left the aircraft via exit 14, also with serious burns.

In the aft section of the aircraft, rows 30 to 41, there were 106 passengers and two cabincrew.

This section corresponds to the zone which proved more structurally resistant to the impact. It was possible to perform evacuation through the two rear exits during about 3 ½ mins, before a big explosion occurred and this part was thereafter totally consumed by fire .

The survivalrate in this zone was 100%, with relatively low morbidity in relation to the other sections.

The left exit (14) opened by structural deformation before the aircraft had stopped and the slide deployed, but did not inflate.

83% of the passengers and the two cabin crew from this zone used this exit, being covered in majority by foam of the firemen .

The right exit (24) was opened by the assigned cabin crew member with partial inflation of the slide which was almost immediately consumed by fire.

The other 17% of the passengers used this exit, right in the beginning of the evacuation . Its use was afterward suspended by the cabin crew due to the presence of fire outside. It was registred in this area 20 serious injuries and/or burns and 48 minor injuries, with the rest of the occupants being uninjured.