

Working Paper

for

Presentation at the 13th BSCE Bern

Bird Strike Tests With Radomes And  
Windscreens Of The HFB 320 Hansa Jet  
And Transall C 160

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1. Introduction

This report contains a summary of bird strike tests which have been carried out on different aircraft types in accordance with requirements as per CAR 46 (AIR 2051/4.52) in the period between 1962 and 1970.

All tests which are described below have been carried out using a bird of 1.844 kg (4 lbs) shot from a compressed-air gun whereby it was possible to reach an impact velocity of between 478 km/h and 612 km/h.

A detailed report will be available on request after the 13th BSCE meeting.

2. Summary of tests carried out on components of different types of aircraft

2.1 Basic tests carried out on a special measuring nose with glass dome.

The weight of the projectile amounted to  $W = 2,14$  kg, and the impact velocity was  $v = 400$  km/h.

The measuring nose consisted of GRP, and was equipped in front with a dome-shaped glass pane of 10 mm thickness.

The glass dome was detached from the GRP nose under the impact of the bird, and destroyed.

Approximately 30 % of the resulting fragments were lying on the ground in front of the nose section after the shot.

2.2 Aircraft type HFB 320 Hansa Jet

2.2.1 Bird strike test on radome (GRP).

The weight of the projectile amounted to  $W = 1,79$  kg, and the impact velocity was  $v = 612$  km/h.

The projectile cut through the radome thereby causing the GRP mats to tear radially from the center which resulted in long fragments. One of the latch fittings was torn off as a result.

It can be assumed with certainty that the radome would have come off, endangering the engines and/or the tail unit.

2.2.2 Determination of resistance to bird strike  
of front windows.

Several shots were fired with an impact velocity  
of between  $v = 478$  km/h and  $v = 590$  km/h.

The weight of the projectile was 1,8 kg.  
After several shots had been fired, the window  
panes cracked that is they were pierced in part.  
This led to fragmentation.



The weight of the projectile was  $W = 1,8$  kg.  
The transparency of the panes had disappeared to some extent after several shots. The panes splintered and were pierced in part whereby the projectile "hurt" or "killed" the dummy of a pilot.

2.3.4 Test subsequent to paras. 2.3.1, 2.3.2 and 2.3.3

Front windows (artificially aged by means of temperature shocks).

Materials: toughened glass  
                  stretched acrylic.

Several shots were fired with an impact velocity of  $v = 490$  km/h ( $\pm 5$  % permissible tolerance).

The weight of the projectile was  $W = 1,8$  kg.

All window panes suffered damage and/or were pierced in part as a result of which a great amount of tiny splinters was hurled inside the flight compartment which caused "severe injuries" to the dummy pilot.

2.3.5 Final test on front windows Transall C 160

Comparative test with panes made of different materials.

Materials: toughened glass  
                  stretched acrylic.  
                  Combination of toughened glass and  
                  stretched acrylic.

2.3.6 Bird strike test on radome Transall C 160

The measured impact velocity was  $v = 510 \text{ km/h}$ .

The weight of the projectile was  $W = 1,8 \text{ kg}$ .

The radome was pierced by the projectile without resulting fragmentation.

The only effect was that the paint started to flake in several places on the radome.



4. Conclusion

The following paragraphs are concerned with the future participation of MBB in the work group "Structural Testing" and/or the BSCE.

On account of stricter airworthiness requirements (FAR 25.631, Amdt. 23) calling for safety measures to exclude damage to the tail unit even if the aircraft is hit by an 8 lb - bird, new bird strike tests may become necessary in the course of development of further civil aircraft projects.

Experiences gained in the process (as well as other information of a more general character) should be, with regard to the further development of European regulations (JAR) in particular, summarized in an "Advisory Circular Joint" (ACJ) and incorporated in the existing book of regulations.

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