

Failure Analysis of Bubble Canopy: MiG-29 Aircraft

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An aircraft canopy is the transparent enclosure on the cockpit of aircrafts which provides a weatherproof and safe environment to its occupants. During World War II, bubble canopies were brought into use in many aircrafts. It was made without bracing and provided a wider field of

view to the pilot. Over the years, there has been paradigm shift in the materials used for the construction of aircraft canopies. Earlier it were made of numerous pieces of flat glass held in position by a frame and muntins. The muntins reduced visibility, which was especially problematic for military aircraft. Then came the glass canopies which were soon replaced by acrylic canopies. These not only protected the occupants from being hit by sharp shattered pieces during accidents but also were very light in weight. They are continued to be used in most of the modern fighter planes. This study involves the evaluation

of the causes of failure of a MiG-29 Aircraft whose canopy bubble was found to be cracked on the rear portion of the periscope during last flight service check. The canopy made of stretched acrylic was subjected to various examinations like SEM, DSC, TGA, FTIR and it was concluded that the crack generated from a completely chipped area of material from the canopy glass base. This was likely due to foreign object hit while at higher altitude, where the temperatures are low, thereby having a reduced fracture toughness making the organic glass more brittle.

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