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Standard Practice for Inspection of Transparent Parts by Prism[1]

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1. Scope

1.1 Aerospace transparencies undergo high stresses induced by flight, environmental, or other factors. The transparency attachment points are especially subject to fatigue. These areas of fatigue are often obstructed or hidden from normal inspection. An inspector, following the techniques described in this practice, shall use a prism to view damage located near transparency bolt holes, voids, and delamination that are hidden by edge strips or frames.

1.2 The purpose of this practice is to provide acceptable methods for performing prism inspections of transparent materials with specific emphasis on aircraft windscreens and canopies. Caveats and lessons learned from experience are included to assist authors in writing tailored inspection instructions for specific applications.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Terminology

2.1 *Definitions of Terms Specific to This Standard:*

2.1.1 *coupler, n*—a liquid refractive index-matching agent or wetting agent (for example, glycerol) used to create optical contact (coupling) between the prism and transparency.

2.1.2 *delamination, n*—the separation of a laminate into its constituent parts. An edge delamination is open to the laminate's free edge. An internal delamination is contained within the laminate.

2.1.3 *edge attachment, n*—the means of fastening the side edges of a transparency to the aircraft structure. Edge attachments also include expansion joints and any other connection between the transparency and the aircraft structure.

2.1.4 *prism, n*—a transparent optical element with polished plane faces for the entrance and exit sides. Prisms use refraction or internal reflection or both to change the direction of the propagation of light.

3. Summary of Practice

3.1 Prism inspections shall be performed with the aid of a prism and a wetting agent. The wetting agent is between the prism and transparency to ensure good visibility. The examiner looks through the prism to see the area of the transparency below the prism. The exam is best done without bright sunlight, which causes glare. The examiner changes his angle of view and inspects the area seen in the prism. A trained eye can detect anomalies such as cracks, delaminations, and voids.

4. Significance and Use

4.1 Prisms are useful tools for viewing areas otherwise obstructed or hidden from normal viewing. For example, transparency bolt holes, voids, and delaminations that are covered by edge strips or frames can be seen through a prism. The prism, once put against the transparency, with a coupling agent to wet the surfaces, allows viewing of the area below where the prism is placed.

5. Apparatus

5.1 *Prism*—Material shall be of the same hardness as or softer than the transparency to avoid scratches. The angles of the prism should be set so as to maximize the viewing area. In the case of a complex shape, the position of the inspector's head and potential interference problems shall be considered to ensure the inspector can look through the prism at the proper angles. A typical prism is a 30º–60º–90º triangle, although the prism does not need to be triangular; it could be a simple rectagon shape.

5.2 *Flashlight*—A high output, halogen bulb works best.

5.3 *Cover*—To allow the inspector to shade the inspection area if the inspection is done in bright sunlight.

6. Reagents

6.1 Use glycerol (USP Grade) as a coupler or wetting agent.

6.1.1 The wetting agent shall not harm the transparency (for example, cause crazing), shall be clear, and shall have a high enough viscosity to stay in place reasonably well.

6.2 Use distilled water.

[1] This practice is under the jurisdiction of ASTM Committee F07 on Aerospace and Aircraft and is the direct responsibility of Subcommittee F07.08 on Transparent Enclosures and Materials.

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