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## A review of the recent developments in surface treatment techniques for bonded repair of aluminum airframe structures

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**Abstract:** Standard on-aircraft phosphoric acid anodizing processes such as PACs (Phosphoric Acid Containment system) and PANTA (Phosphoric Acid Non-Tank Anodizing) techniques are time consuming to apply and potentially hazardous in the repair applications. Finding a suitable alternative to the standard processes is becoming an increasingly active and important area of research in the aerospace industry. Recently developed techniques, such as silane and sol-gel surface treatments are time efficient and require little new capital investment. However, such treatments have the potential to introduce additional complexities and require rigorous controls of their own. In this paper, we review various in-service surface treatment techniques for bonded repairs on the airframe structures, including the use of 120 °C (250 °F) cure type film adhesives as well as both standard and new surface treatment methods. The relevant problems, concerns of implementation and the overall performance of bonded structures, including strength and durability, are discussed and compared.

**Keywords:** Bonded repairs; On-aircraft phosphoric acid anodizing; Silane; Sol-gel; Bonding performance

### 1. Introduction

The aging aircraft problem is one of the most serious challenges currently facing the commercial air transport industry [1–3]. Over its operational lifetime, the primary threats to an aircraft's integrity include multiple site damage, environmental degradation, corrosion and impact damage [1,2]. A survey was

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