



## **Inspection and Teardown of Aged In-Service Bonded Repairs**

Waruna Seneviratne, John Tomblin, and Brandon Saathoff  
Wichita State University  
Wichita, Kansas

### **ABSTRACT**

In-service repairs performed with trained technicians and qualified materials and processes must restore the original structural capability with minimal alteration to the original load path to ensure the safe operation of aircraft throughout the remaining life of the component. Therefore, long-term durability under operational environments and GAG loading must be understood and the aging mechanism must be investigated to support maintenance practices and to establish criteria for structural retirement. Detailed nondestructive inspections (NDI), teardown inspections, and laboratory testing of bonded repairs on aircraft components that have been retired from service provide vital information related to the aging mechanism and any undetected material degradation. The current research program intends to conduct aging studies with the help of industry to gain the related background data on design, service history of individual component and relevant repair information (ex., known service problems related to fluid ingress or disband). Several decommissioned structural members, both metal and composites, with multiple repairs will be subjected to detailed teardown inspections and limited cyclic loading on selected articles, where applicable, in order to determine the remaining life of those repairs; the primary focus of the research will be on the teardown inspections and bond integrity evaluation. Background data on each repair such as repair process and historical flight data will be correlated to test observations on bondline integrity and durability of repairs. The main goal of this research program is to evaluate bondline integrity and durability of in-service repairs on composite structures in commercial aircraft in order to provide guidance into AC 65-33 (Development of Training/Qualification Programs for Composite Maintenance Technicians) and AC 43-214 (Repairs and Alterations to Composite and Bonded Aircraft Structure). In addition, research scope is increased to identify a "fleet leader inspection approach" to evaluate structural bonding through teardown and detailed inspections for "aged general aviation aircraft structures" and establish protocol for such an evaluation that will facilitate future advances for new products.