

Full Scale Fatigue Testing for Mitsubishi Regional Jet

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Mitsubishi Aircraft Corporation is performing the full-scale fatigue testing (FSFT) for Mitsubishi Regional Jet (MRJ) type certification (Figure 1). Main objective of this test is to show freedom from wide spread fatigue damage (WFD) during the life of aircraft and establish Limit of Validity (LOV). Prior to the test, WFD susceptible structures are defined based on the stress distributions and structure configurations, and they are fully covered by this test. Test duration of FSFT is 240,000 flights (3 x DSG of 80,000 flights). The flight-by-flight loading spectrum is newly designed for MRJ and its loads occurrence data was verified by flight test data. Furthermore, to reduce the test duration, low loads omission was applied based on the results of some spectrum verification tests. During fatigue test, scheduled inspection consistent with MRJ maintenance program is planned. In addition to external and internal visual inspections, some kinds of NDT are applied to the specific area.

Since the main objective of FSFT is no WFD substantiation, no artificial crack is introduced during FSFT. Therefore, damage tolerance evaluation (i.e. crack growth analysis validation) is separately conducted by sub-component level testing. For example, damage tolerance substantiation for fuselage structure was performed by using curved panel test facility (Figure 2). This facility can simulate the pressurization load with axial load and their loading sequence can be customized for each test. Major detail design points of fuselage structure such as the lap/butt-joint, cut-out structure and repaired structure are individually evaluated by this type of tests (Figure 3). Based on the test results, potential fatigue critical locations and crack growth behaviors are efficiently investigated, and they significantly contribute to the crack growth analysis validation necessary for CFR/CS 25.571 compliance.



Figure 1. MRJ full-scale fatigue test setup.



Figure 2. Fuselage curved panel test setup.

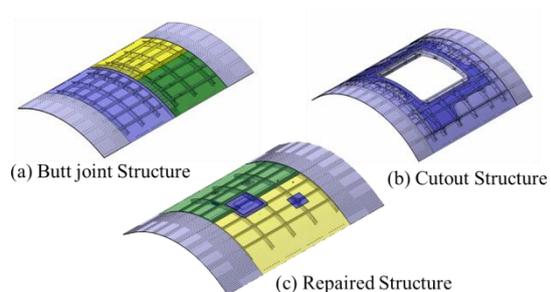


Figure 3. Curved panels for damage tolerance evaluation.

Keywords: full-scale fatigue test, wide spread fatigue damage, curved panel test, damage tolerance