

Fibre Metal Laminate (FML) Composite

Fibre Metal Laminates (FML) is a kind of hybrid materials and it can be fabricated from an alternating laminate of thin metal sheets and thin composite layers. Since several variables are involved in the composition of this laminate, a wide range of different combinations lamination seems to be possible. Some of these variables are the type of metal alloy, the type of fibres, the type of polymer, the thickness of layers, the number of layers, the orientation of (fibrous) layers, etc. Therefore, FMLs are regarded as a family of laminates, and GLARE is the best-known member of these laminates. GLARE is made from aluminum layers in the range of 0.3–0.5 mm thick, and glass fibre reinforced composite layers in the range of 0.25–0.5 mm thick. One of the wide used of GLARE composite is in aeronautic application. Based on the expected growth of passengers for intercontinental flights within the world, high capacity aircraft (such as from the Airbus company) are currently developed. To make this airplane cost effective for the next 30 years, new technologies are being evaluated such as the application of new aircraft materials. One of these studies investigates the feasibility of using the FML in the upper part of the aircraft that needs to be fatigue failure resistant, or specifically the structure should be under damage tolerant design. Fibre Metal Laminate (FML) can be said to have a high fatigue resistance, with it is achieved by the intact bridging fibres in the wake of the crack. This condition restrains the occurrence of the crack opening. Controlled delamination in the material makes some crack opening possible without failure of the fibres. The fibres transfer load over the fatigue crack in the metal layer and restrain the crack opening. This phenomenon is called fibre bridging. The fatigue fibres laminates can be formed and machined like aluminum alloys and have the high specific strength of composite materials: they combine the best of both

worlds. The laminates can be applied in various thicknesses, e.g. a 2/1 lay-up means a laminate with two aluminum layers and one intermediate fibre/epoxy layer: [A1/prepeg/A1]. The fibre/epoxy layer at 2/1 lay-up can be multiple cross plied 0/90 layer or be unidirectional.