

## Chapter Five

# INTERLAMINAR STRESSES

A rather lengthy study began in 1970 with the publication of the paper [19] which involved some insights regarding stress fields in the neighborhood of the free edge of laminate and a relatively primitive (by today's standards) finite-difference formulation of what has become known as the "free-edge problem". The finite difference formulations was conducted by R. B. Pipes who was at General Dynamics at the time and the work served as the basis of his Ph.D. dissertation at the University of Texas/Arlington. Presently, Dr. Pipes is President of Rensselaer Polytechnic Institute. Another pioneer in composite mechanics, Dr. J. E. Ashton, was very instrumental in asking the right questions that led to this important solution. As I recall in that period, many laminate test coupons loaded in axial tension exhibited unusual failure modes, precipitated near the free edges, but aside from some clinical observations by Foye and Baker<sup>1</sup>, had not really been questioned very much except as to note that "composites fail in unusual ways". This problem is another in the class where the formulation requires three dependent displacement variables as a function of two space coordinates.

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<sup>1</sup> R. L. Foye and D. J. Baker, "Design of Orthotropic Laminates," *AIAA/ASME/ASCE/AHS 11th Structures, Structural Dynamics, and Materials Conference*, Denver, CO, April 1970.