

Table 1 Crack Shape Geometries

a/t	1.05, 1.09, 1.13, 1.17, 1.19, 1.21, 2.0, 3.0, 5.0
a/c <sub>1</sub>	0.3, 0.4, 0.6, 0.8, 1.0, 2.0, 5.0, 10.0
r/t	1.0, 1.27, 1.5, 2.0, 2.5

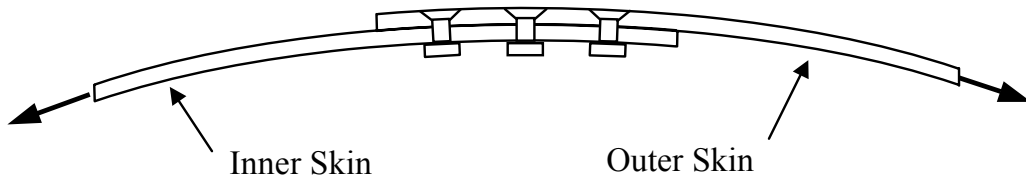


Figure 1 Typical lap-splice joint in aircraft fuselage.

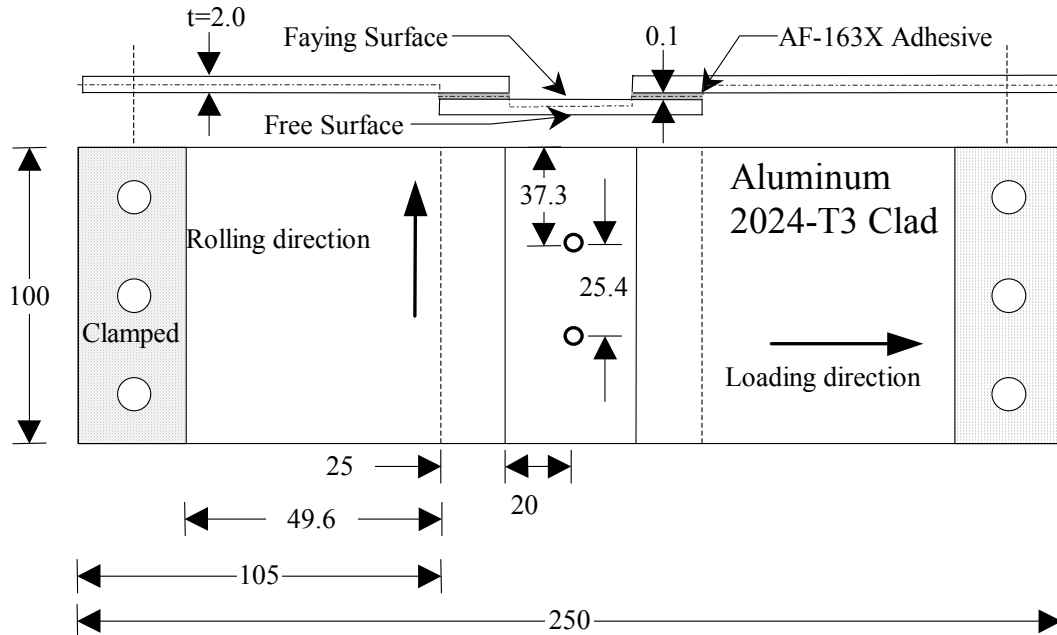


Figure 2 Two holed combined tension and bending specimen (dimensions in mm).

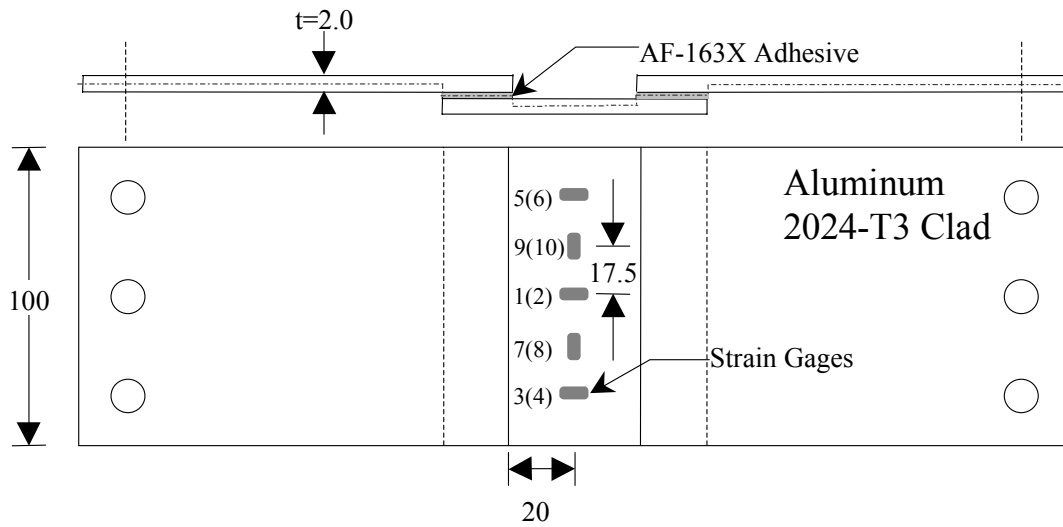


Figure 3 Position of strain gages in specimen without the two holes shown in Figure 2.

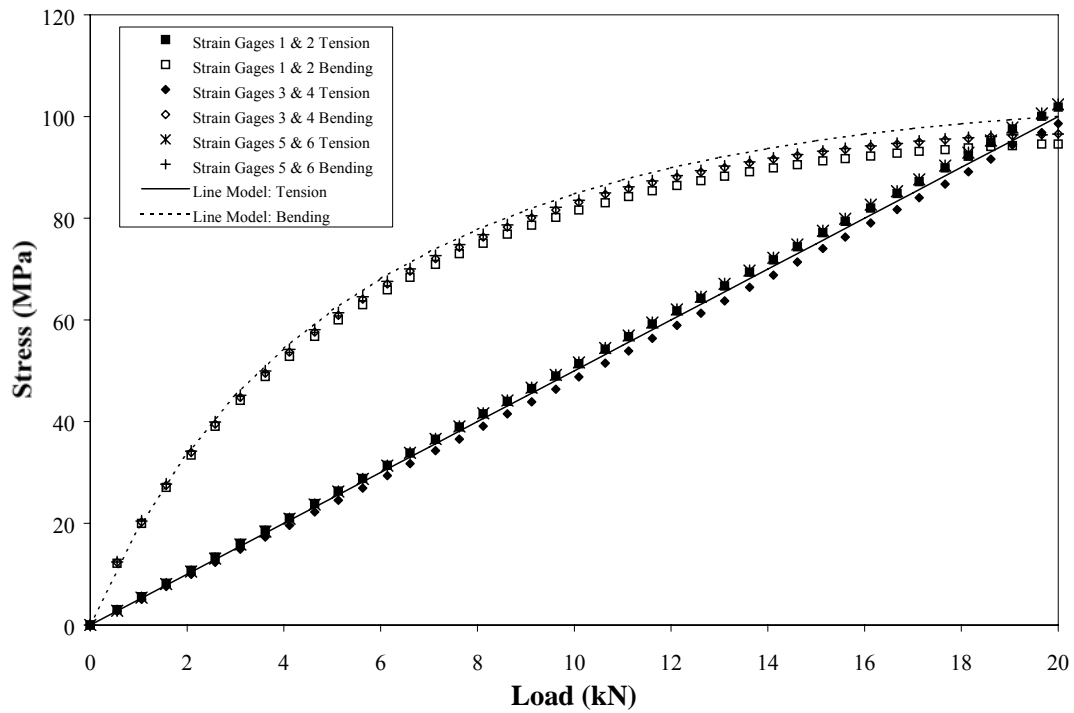


Figure 4 Comparison of the measured and calculated stresses for the tension and bending specimen

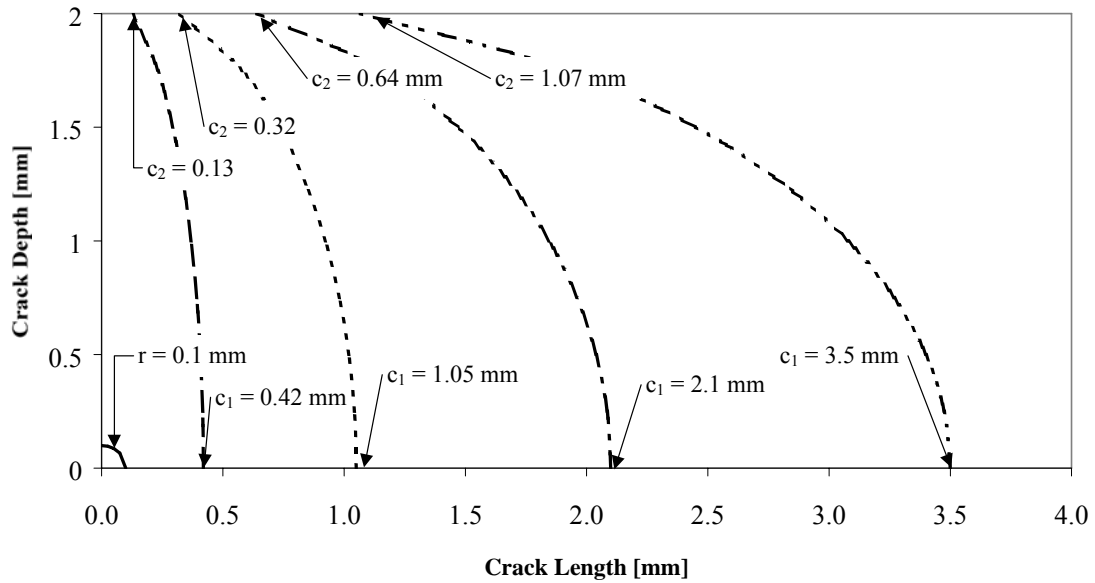


Figure 5 Crack shape of the EDM notches in the test specimens, for  $r/t = 1.275$ ,  $a/t = 1.05$  and  $a/c_1 = 0.6, 1.00, 2.00$  and  $5.00$ .

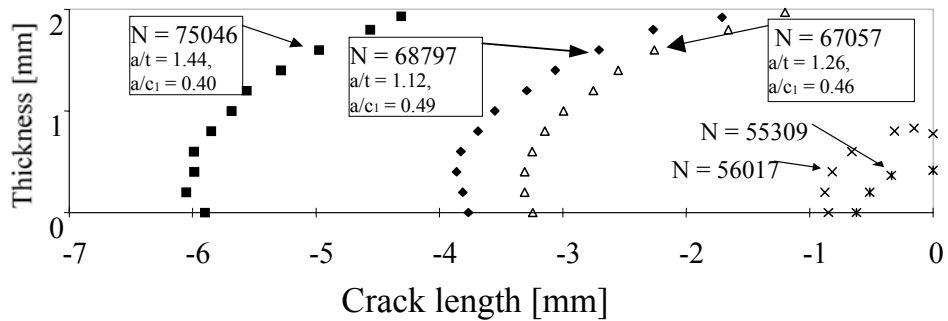


Figure 6 Crack shape through the thickness for different numbers of fatigue cycles for different specimens

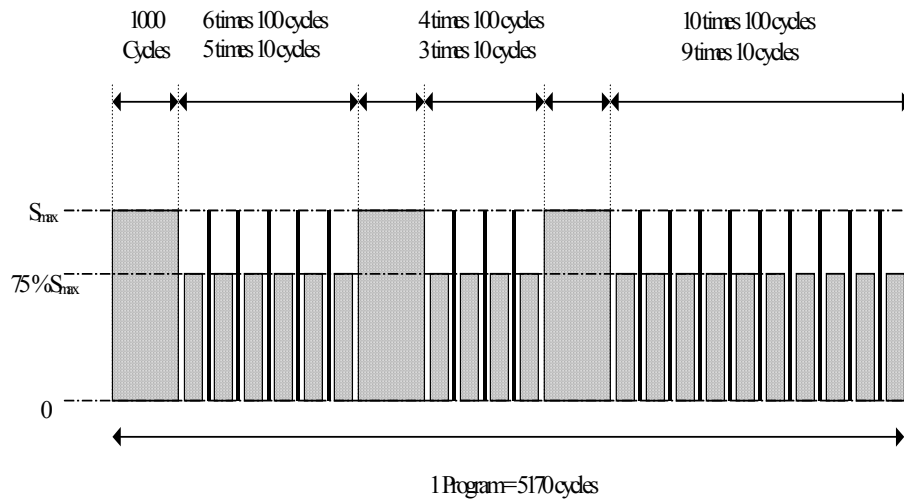


Figure 7 Load history of marker load (ML) spectrum.

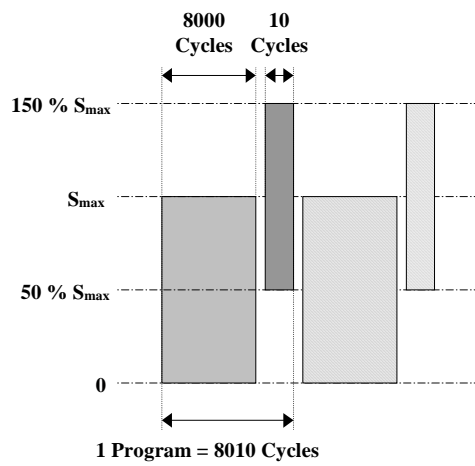


Figure 8 Overload (OL) spectrum.

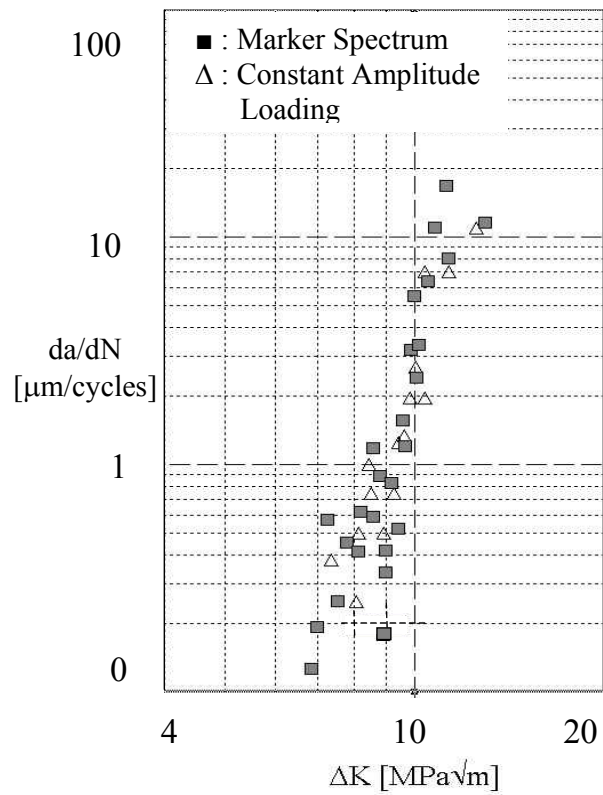


Figure 9 Crack growth rates of the marker load spectrum tests corrected for the marker loads and a constant amplitude test.

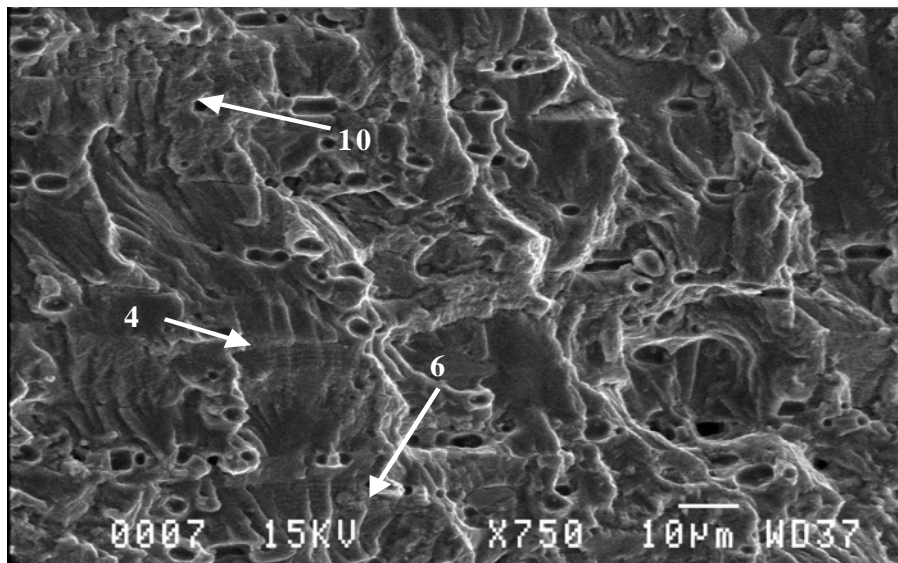


Figure 10 Marker bands on the fracture surface

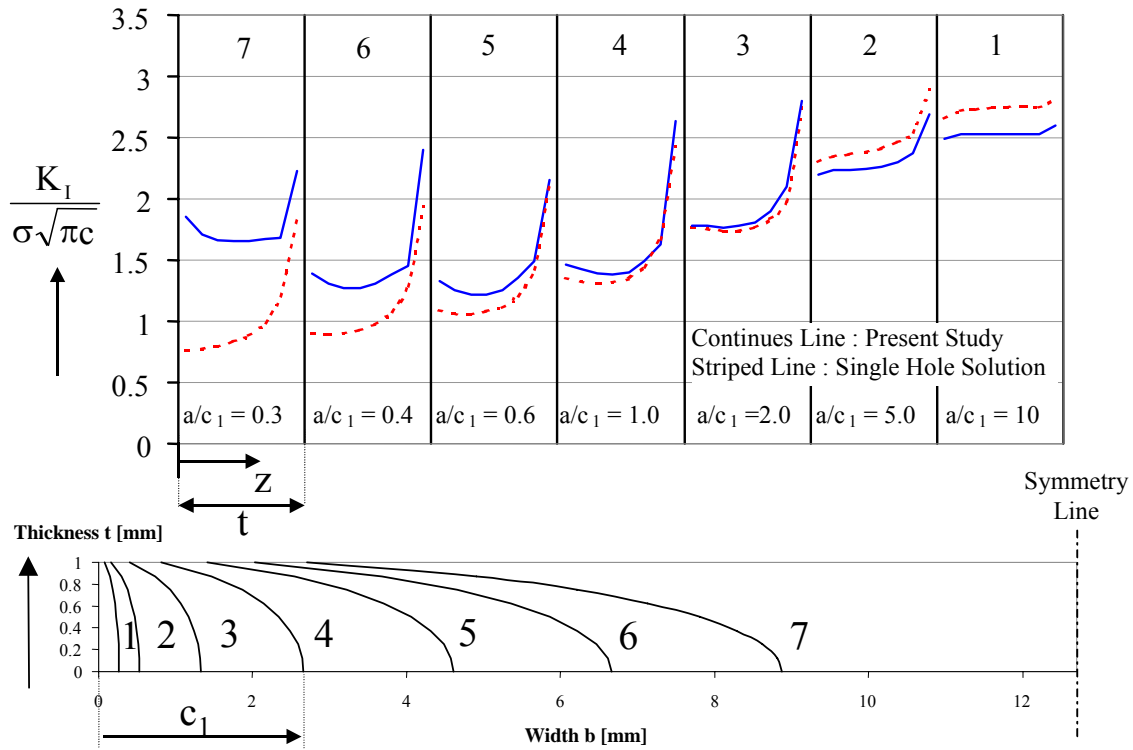


Figure 14 Effect of changing  $a/c_1$  on  $\beta$  for  $a/t = 1.05$  and  $r/t = 1.0$ . Comparison between infinite row of open holes and single open hole shows crack interaction effect

macroscopic measurements. For cracks growing from the bore of the hole towards the centerline

growing from the bore of the hole towards the edge of the specimen

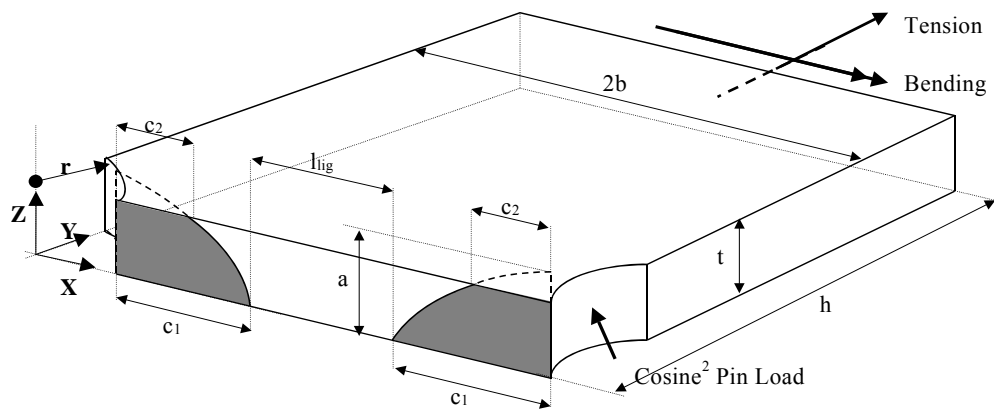


Figure 13 Crack shape showing  $a$ ,  $t$ ,  $c_1$  and  $c_2$ . Where  $l_{lig}$  represents the remaining intact net section of material between cracks growing towards each other  $l_{lig} = 2 \cdot (b - r - c_1)$ . Tension, Bending and  $\text{Cosine}^2$  Pin Load are applied unit stresses.

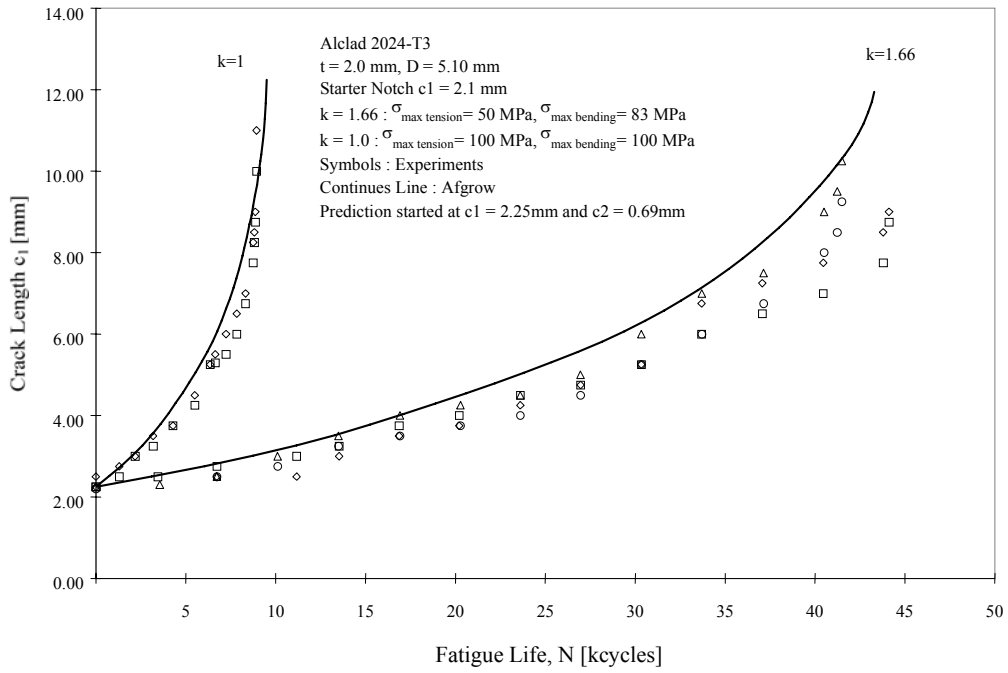


Figure 16 AFGROW verification crack growth faying surface, combined tension and bending for  $k = 1.0$  and  $k = 1.66$  with starter notch  $c_1 = 2.1$  mm

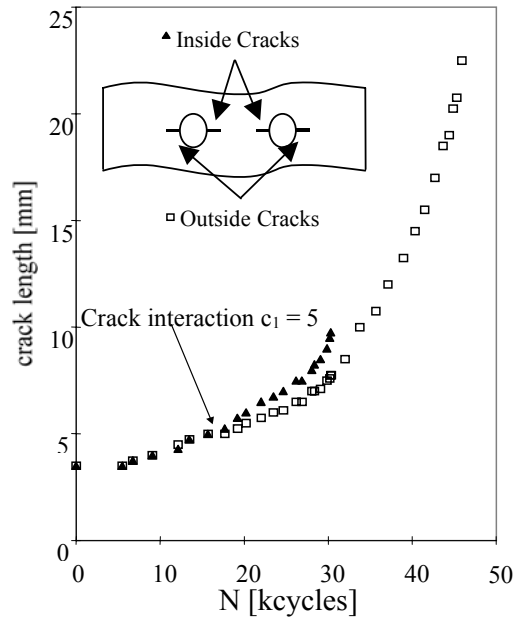


Figure 15 Crack interaction

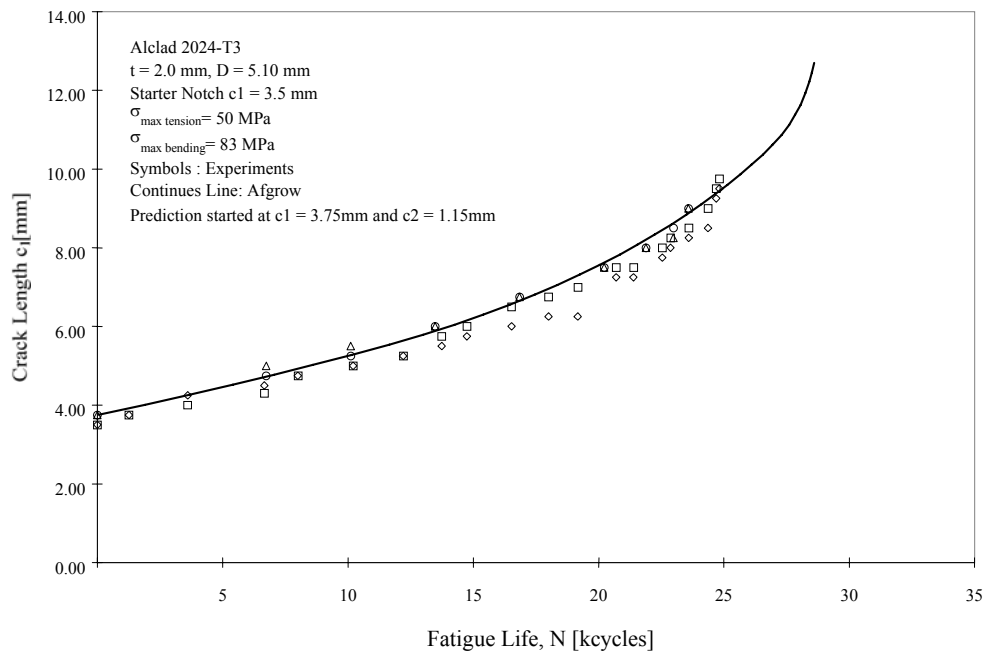


Figure 17 AFGROW verification crack growth faying surface, combined tension and bending for  $k = 1.0$  and  $k = 1.66$  with starter notch  $c_1 = 3.5 \text{ mm}$



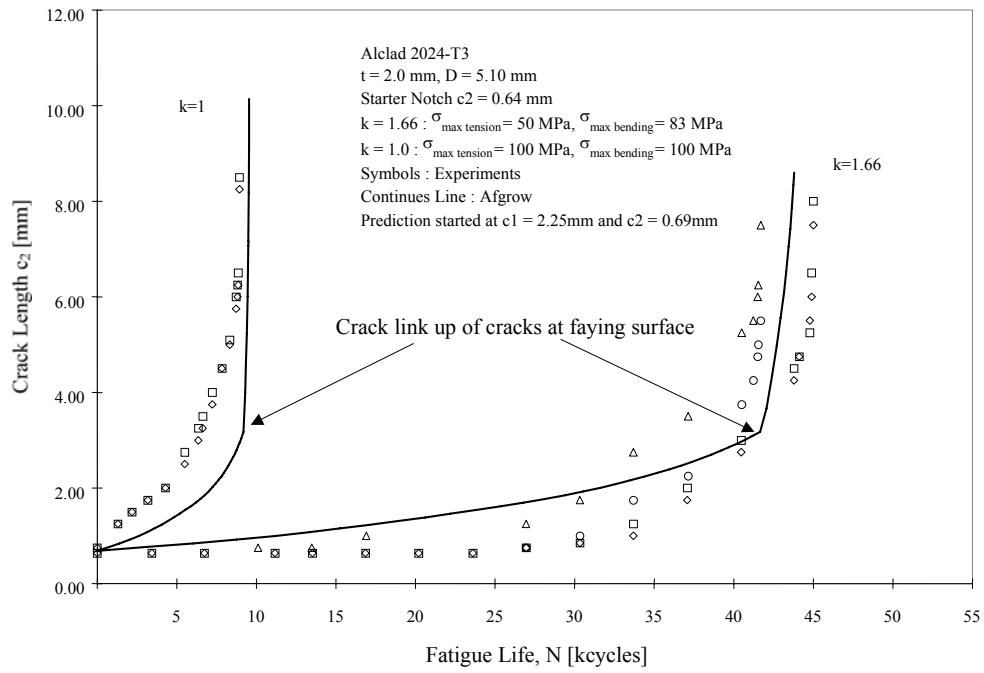


Figure 18 AFGROW verification crack growth free surface, combined tension and bending for  $k = 1.0$  and  $k = 1.66$  with starter notch  $c_2 = 0.64 \text{ mm}$