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Attention: Dr M. Fox NTSB

Piper PA-28R-201 Spar Cracking: Summary and Recommendations

Summary of Analyses

The task involved the review of NTSB Material Laboratory reports and other open-source related materials.

The lead crack framework was then applied to cracking in seven cases (Spar A, Spar B, N8191U Left, N104ER Left, N106ER Right & Left, and N2093 Right).

These analyses produced a relatively tight cluster of crack growth curves and indicated that the critical crack size is approximately 10mm deep. Given the assumptions made, Spar A crack was amongst the fastest growth.

Recommendations:

1. As it appears unlikely that additional flight data or record of discreet events will become available, I believe that additional quantitative fractography is not warranted.
2. As the nucleating discontinuity depth is a critical factor in the analyses, and a typical common depth was used, further investigation of typical discontinuity sizes in AA2024 is warranted and prudent. There is likely to be sufficient data in the literature to conduct this analysis (Molent).
3. Further definition of the depth and type of the nucleating discontinuity in the seven cases study should be undertaken (Fox).
4. The reason for the tearing that led to Spar C crack should be further investigated (Fox).
5. The event leading to a prominent progression mark on Spar B should be pursued.
6. Lead Crack Framework training of the NTSB should be pursued.

Conclusions

Given the lack of in-service histories of the subject aircraft and the availability of maximum crack depth versus estimated flight hours, and subject to the caveats and assumptions provided previously, the lead crack framework was applied to estimate the crack growth curves for the subject aircraft.

It was noted that Spar B appeared not to be the fastest growing crack found to-date.

Some recommendations for further investigations etc. are provided above.

L. Molent
18 March 2022

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