Experimental and Numerical Investigation of Fracture in Aluminium

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Summary:

To assess the problem of containment after a blade-off accident in an aero-engine by numerical simulation the FAA has instigated a research effort concerning failure prediction in a number of relevant materials. Aluminium kicked off the program which involved an intensive testing program providing failure data under different states of stress, different strain rates and different temperatures.

In particular split Hopkinson bars were used to perform dynamic punch tests on plates of different thicknesses allowing to investigate the transition between different failure modes such as petaling and plugging. Ballistic impact tests were performed at NASA GRC for the purpose of validation.

This paper focuses on the numerical simulation effort and a comparison with experimental data is done. The simulations were performed with LS-DYNA and a tabulated version of the Johnson-Cook material law was developed in order to increase the generality, flexibility and user-friendliness of the material model.