

CS 31HB.44 Protection of envelope against tearing

ED Decision 2011/013/R

The design of the envelope must be such that, while supporting limit load, local damage will not grow to an extent that results in uncontrolled flight or landing.

[Amdt No.: 31HB/1]

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Unless it can be demonstrated that basic envelope fabric has sufficient rip-stopping capability, horizontal and vertical load tapes and/or other rip-stoppers should be incorporated into the structure of the envelope so that likely tear lengths are limited to those for which level flight can be maintained. Failure of the envelope between rip-stoppers should be taken into account in the proof of the structure.

Demonstration of sufficient rip-stopping capability of the envelope fabric.

The objective of this demonstration is to show that the envelope fabric is sufficiently damage resistant. It therefore needs to be determined at what tear size the envelope fabric would continue to tear under the maximum tension and conditions (Temperature) experienced in normal operation. In this AMC this tear size is called the critical damage.

In order to establish that the determined damage resistance is sufficient, the critical damage should be reviewed in relation to local damage foreseeable in normal operation. The local damages to be considered are:

1. Existing damage that may be undetected during pre-flight inspection, and
2. Limited damage, inflicted during flight where the size of the damage in itself would not result in a catastrophic failure. (e.g. a limited damage caused by hitting a branch or other basket during take off)

The resistance of envelope fabric to damage propagation should be determined by test.

Determine the critical damage to the envelope fabric at the maximum tension experienced in service. Critical damage is the maximum damage at which growth does not occur.

Damages to be considered are:

1. A slit in the most unfavourable direction;
2. A crosswise slit in the most unfavourable directions.

Test requirements

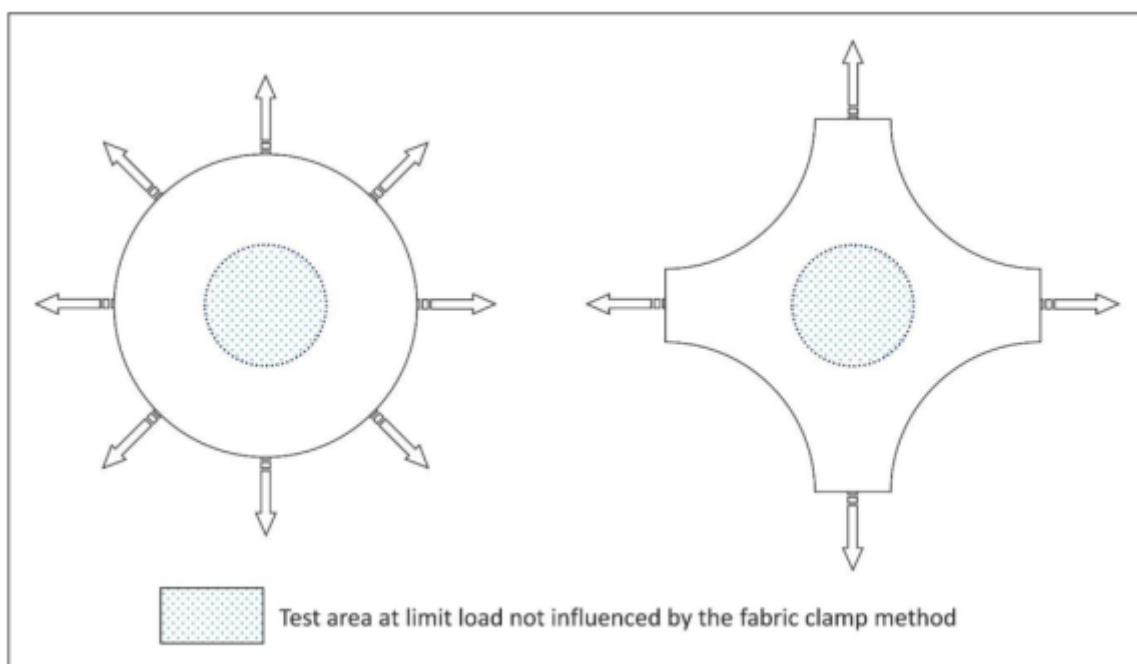
The envelope fabric should be tested at maximum tension experienced in service. The effects of temperature on the material properties must be taken into account.

The tension in the test area of the specimen of the fabric should be equal to the maximum tension experienced in service and the test method should not create unacceptable tension re-distributions in the test area when the test is conducted.

A step-wise increase of the damage (e.g. a cut with a sharp knife) should be used to determine the critical damage size.

Between the step-wise increases of the damage, enough time should be permitted for the tension re-distribution at the damage location.

The critical damage length of the material should be recorded.



Examples of a circular or 2-directional test set-up

Examples of a circular or 2-directional test-set-up.

Pre-flight inspection requirements

The design of the envelope and pre-flight Inspection method should be such that visible damage considerably smaller in length than the critical damage length can be detected during a pre-flight inspection. The impact of ageing and operating circumstances should be considered when establishing the margin between critical damage and detectable damage length (refer to [CS 31HB.27\(f\)](#)).

Design features that could possibly hinder detection of damage during a pre-flight inspection should be avoided or taken into consideration when the detectable damage length is determined.

Note 1: It is assumed that a visual pre-flight inspection will detect damage above 10 cm.

Note 2: The critical damage is a design property that should not be confused with acceptable damage as provided in the flight manual.

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