# CS 31GB.27 Strength and proof of strength

*ED Decision 2011/012/R*

1. The structure must be able to support limit loads without permanent deformations or other detrimental effects.
2. The structure must be able to withstand ultimate loads for at least 3 seconds without failure.
3. Proof of strength of the envelope material and other critical design features must be tested.
4. The basket must be of a generally robust design and afford the occupants adequate protection during a hard or fast landing. There must be no design feature that by reasonably envisaged distortion or failure would be likely to cause serious injury to the occupants.
5. Each item of mass that could cause an unsafe condition if it broke loose must be restrained under all loads up to the ultimate loads specified in this paragraph. The local attachments in the load path between the restrains and the structure should be designed to withstand 1.33 times the specified ultimate loads

   Horizontal 6 g,

   Downward 6 g,

   Upward 2 g.

6. The design and strength of components must also consider the effects of recurrent and other loads experienced during transportation, ground handling and rigging.
7. The effect of temperature and other operating characteristics that may affect strength of the balloon must be accounted for.

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Proof of compliance with the strength requirements must cover the balloon’s entire operating range. Proof by calculation only can be accepted for designs where it has been demonstrated by experience that such calculation gives reliable results. Load tests need to be performed in all other cases.

## AMC 31GB.27(c) Strength and proof of strength

*ED Decision 2011/012/R*

The envelope tests may be performed on representative portions of the envelope provided the dimensions of these portions are sufficiently large to include critical design features and details such as critical seams, joints, load-attachment points, net mesh, etc. Also refer to CS 31GB.44 for specific tear propagation requirements.

# AMC 31GB.27(d) Strength and proof of strength

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A drop test needs to be performed if it is not possible to make use of an existing proven basket of the same or similar design (in terms of construction method, size, layout, etc.) for a balloon of the size that is the subject of the application. In the absence of an alternative test proposal, this test must be performed at the maximum design mass of the basket in a manner that simulates the effects of gravity that occur as realistically as possible. The basket is dropped onto a horizontal concrete surface from a height of 1 m at 0°, 15° and 30°. The drop test should not result in deformation or fractures which, by their nature, could lead to the serious injury of occupants.

Note: It has been shown by a number of decades of in-service experience that the traditional reinforced woven wicker and willow basket design offers a combination of resilience and impact resistance that can contribute considerably to the protection of occupants. The structure is also able to absorb considerable kinetic energy during impact on the ground or against obstacles.

# AMC 31GB.27(e) Strength and proof of strength

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Items of mass (e.g. batteries or equipment) inside the basket or attached to the suspension system near or above the occupants should be considered because of their risk to the occupants.

Items of mass that do not cause a risk to the occupants during a hard or fast landing, but could become detached from the balloon (e.g. ballast attached to the outside of the basket), should be considered because of the potential loss of mass.

# AMC 31GB.27(f) Strength and proof of strength

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The strength requirements need to include consideration of loads during transport, ground handling and rigging. The loads need to be determined and the parts and components need to be designed in accordance with their designated use and dimensioned such as not to fail under recurrent loads.

→ CS 31GB.28