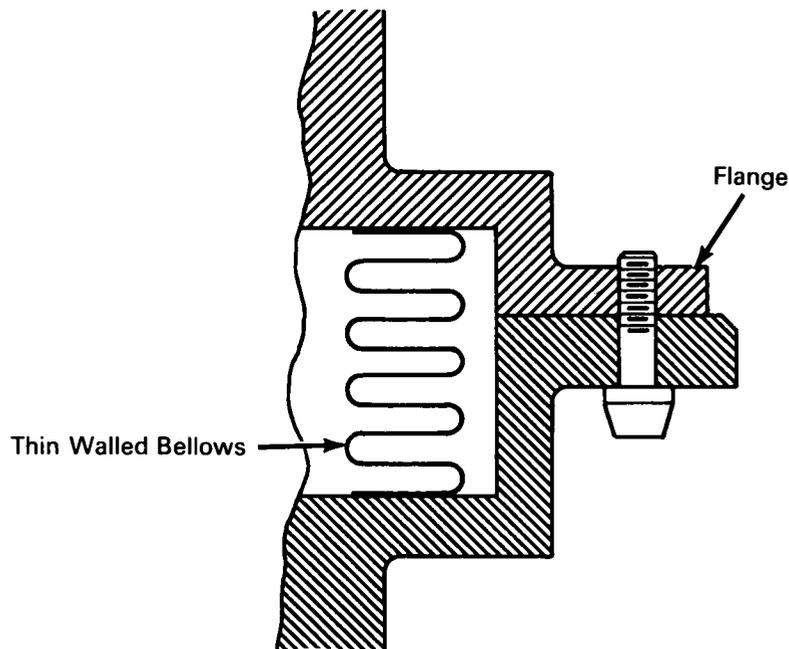


# NASA TECH BRIEF



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## Bellows Joint Absorbs Torsional Deflections in Duct System



### The problem:

In flexible duct design, torsional loading (rotation about the duct axial centerline) is induced because of duct routing and induced deflections. In previous designs, bellows were very rigid in torsion and were unable to deflect and relieve these loads. To allow torsional deflection, ducts were usually arranged in a dogleg configuration with a bellows joint in each half of the leg. Torsional loading in either half was absorbed by angular deflection of the bellows in the opposite half. Applications requiring a straight-in approach of the ducts and which offered short space length for their installation could not use conventional ducting designs.

### The solution:

Fabricate a long, thin-walled bellows and compress it into a short length. In theory, a long, thin-walled tube compressed into a short bellows can absorb the same amount of torsional deflection as the same tube in its full length condition.

### How it's done:

A long, thin-walled bellows is compressed into a short length and then installed in a flanged linkage which takes the pressure separating load and restricts the motion that the bellows can absorb to torsional deflections. The bolts holding the two flanges of the torsional bellows are loosely torqued to take the pres-

(continued overleaf)

sure separating load and allow relative torsional deflection between the two.

The torsional bellows has a lower torsional spring rate than any of the other bellows in the duct assembly and, thus, absorbs the bulk of the duct's torsional deflections, leaving the other bellows of the duct assembly free to take care of the axial and angular deflections.

**Notes:**

1. Piping and ducting designers may use this design to reduce duct complexity, cost, and space.

2. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer  
Marshall Space Flight Center  
Huntsville, Alabama 35812  
Reference: B66-10332

**Patent status:**

No patent action is contemplated by NASA.

Source: C. M. Daniels  
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