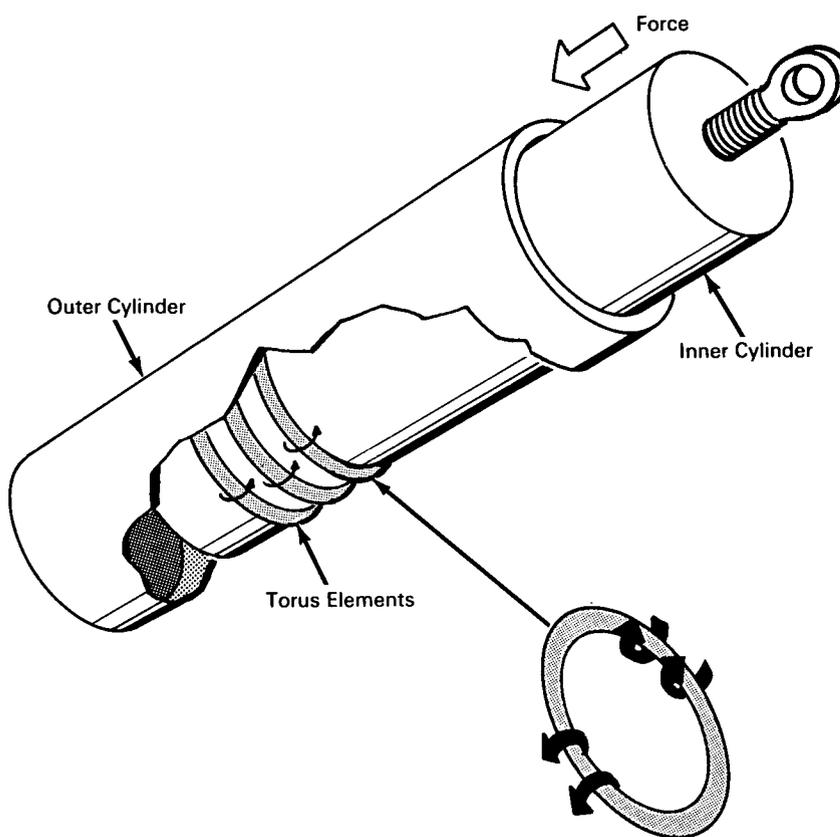


# NASA TECH BRIEF



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## Torus Elements Used in Effective Shock Absorber



### The problem:

To design a high rate energy absorption device that will operate equally well in tension or compression with repeatability.

### The solution:

An energy absorbing device that forces torus elements to revolve annularly between two concentric tubes when a load is applied to one of the tubes.

### How it's done:

The device consists of two concentric tubes between which a varying number of torus elements can be mounted. The torus elements are loops of ductile material either in the form of rings or a continuous spiral. As illustrated, with a load imposed on one of the tubes, the torus elements are forced to revolve between the tubes, introducing cyclic tension and com-

(continued overleaf)

pression on the fibers or crystals, and thus absorb energy.

**Notes:**

1. Interference forces can be varied by using torus elements of different thicknesses.
2. The device is well suited to shock attenuation problems in which large onset rates can be tolerated, and is also ideally suited to structural overload problems. In the latter application, the device would undergo negligible deformation (creep) under normal service loads, but would yield at a preselected overload.
3. The negligible maintenance requirement and rugged, weatherproof character of this device, plus low cost of manufacture suggest vehicle and highway safety applications.

**Patent status:**

Title to this invention, covered by U.S. Patent No. 3231049, has been waived under the provisions of the National Aeronautics and Space Act (42 U.S.C. 2457 (f)) to Aerospace Research Associates, 2017 West Garvey Avenue, West Covina, California.

Source: David L. Platus  
and Patrick Cunningham  
of Aerospace Research Associates  
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