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# NASA TECH BRIEF

*Lewis Research Center*



## High-Reliability Release Mechanism

A release mechanism employing a simple clevis fitting in combination with two pin-pullers achieves a high degree of reliability through active mechanical redundancy. The mechanism was developed as a release system for two solar arrays. Since the failure to deploy either array would compromise the entire mission, reliability was of paramount importance. This mechanism is simple and inexpensive, and has performed effectively. It can be readily adapted to other release-system applications with a variety of pin-puller devices.

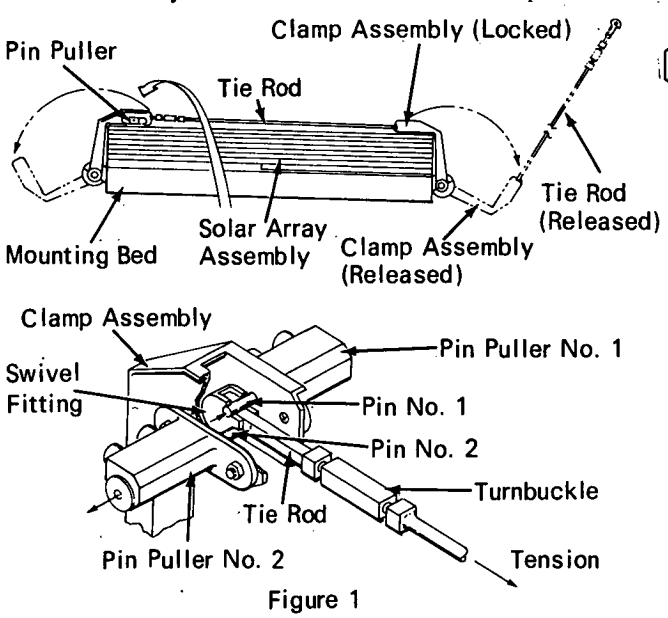


Figure 1

Pin-puller operated release systems, whether actuated pyrotechnically, pneumatically, or by solenoids, typically achieve reliability through the use of back-up commands, dual squibs, or redundant wiring of the squib, valve, and switch components. When properly implemented, redundant circuitry and wiring will reliably ensure against a malfunction occurring from electrical causes. They cannot, however, prevent a mechanical failure of the pin-puller device.

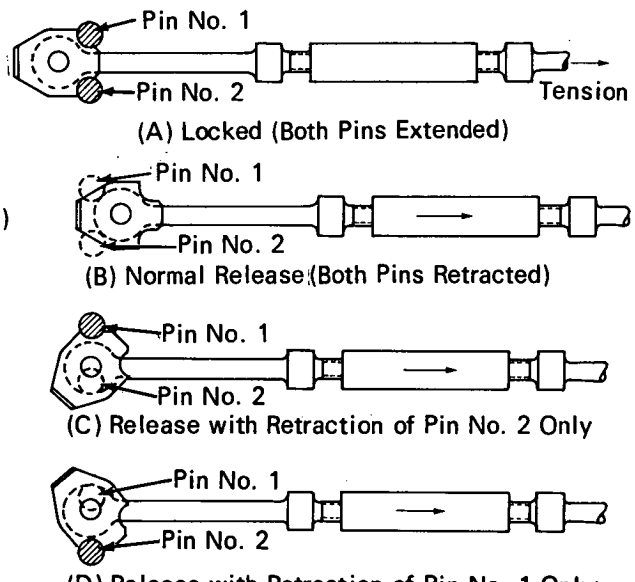


Figure 2

The solar array assembly for which this release mechanism was developed is shown in Figure 1. A tension element (tie rod) restrains two spring-loaded clamp assemblies which lock the folded solar array against its mounting bed. The tie rod is permanently attached to the right-hand clamp assembly. As shown in the detail view, a swivel fitting clevis device at the left end of the tie rod is engaged behind the extended shafts of two pin-pullers, which are mounted in a staggered manner on either side of the left-hand clamp assembly. These pin-pullers

(continued overleaf)

operate with dual squibs, but are qualified for single-squib operation for the cross-pin shear loads associated with this application. The turnbuckle is used to develop the desired preload tension. The solar array deployment sequence is initiated by tie-rod release.

In the locked condition (Figure 2(A)), the swivel fitting distributes tie-rod tension equally to each of the pin-puller shafts in double shear. The swivel fitting automatically compensates for small angular misalignment between the tie rod and pin-puller shafts.

In normal operation of both squibs, both pins are simultaneously retracted, and tie-rod release is effected (Figure 2(B)). Since the pin-pullers are qualified for single-squib operation, failure of one squib in either pin-puller or in both pin-pullers will still cause this simultaneous retraction.

In the failure modes (Figures 2(C) and 2(D)), the failure of either pin to retract causes eccentric loading of the swivel fitting, which then simply rotates and rides over the extended pin, releasing the tie-rod and clamp assemblies.

## Note:

Requests for further information may be directed to:

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## Patent status:

No patent action is contemplated by NASA.

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