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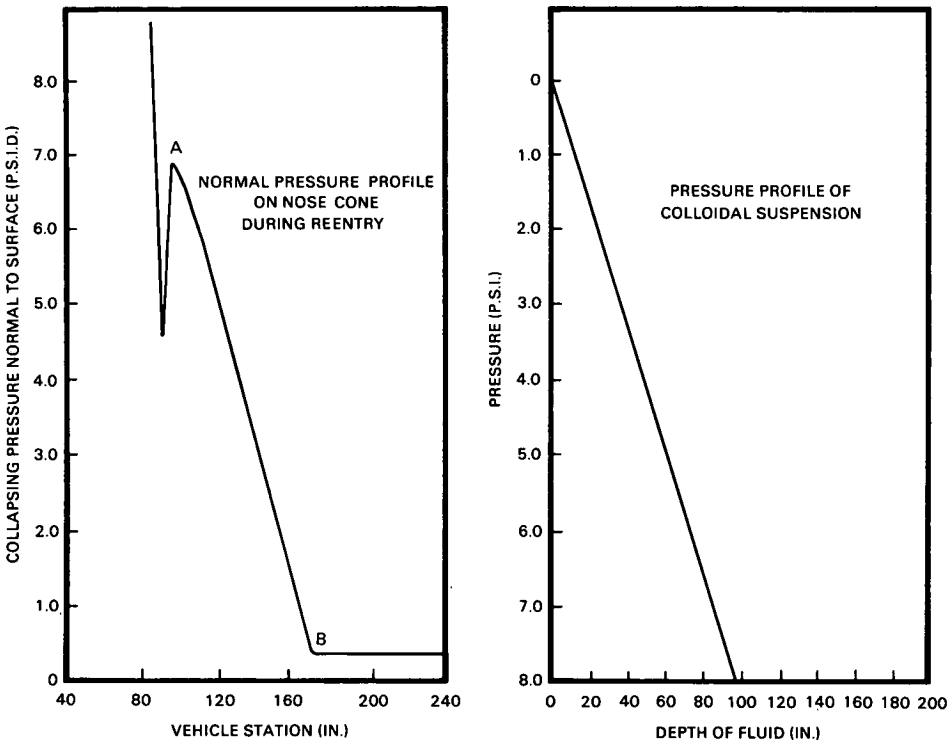
NASA TECH BRIEF

Colloidal Suspension Simulates Linear Dynamic Pressure Profile



The problem:

To apply an experimental test load to a structure simulating the pressure profile present in actual use. Laboratory measurements of stresses on a missile nose fairing required an artificial load to simulate normal dynamic air pressure encountered during reentry.

The solution:

A colloidal suspension that may be prepared with various specific gravities to simulate many linear pressure profiles. Missile nose fairings immersed in the suspension are subjected to stress patterns very similar to those encountered during reentry.

How it's done:

Dynamic air pressures present on a missile nose fairing during reentry are recorded by flight test monitoring. A plot of theoretical pressures normal to the fairing surface at various stations along the length of the surface is shown in the left figure. Between stations A and B, the pressure varied linearly with respect to axial vehicle station.

(continued overleaf)

To simulate this linear pressure profile for laboratory stress measurements, a colloidal suspension (sol) of 16 parts water, 100 parts iron pyrite, and 4 parts clay is prepared. A nose fairing with strain gauges and deflectometers mounted at selected axial stations is immersed in the suspension, and fluid pressure of the sol is indicated at depths corresponding to the structural stations. The pressure/depth line derived from this test is shown in the right figure to closely approximate the pressure profile shown in the left figure. Stress and deflection conditions very similar to those expected during atmospheric reentry are thus attained in the laboratory.

Notes:

1. This technique could be useful in underwater research.
2. The formulation of the sol can be varied to simulate a wide range of pressure profiles.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Western Operations Office
   150 Pico Boulevard
   Santa Monica, California, 90406
   Reference: B66-10214

Patent status:

No patent action is contemplated by NASA.

Source: R. J. McCann
of Lockheed/Sunnyvale
under contract to
Western Operations Office
(WOO-266)