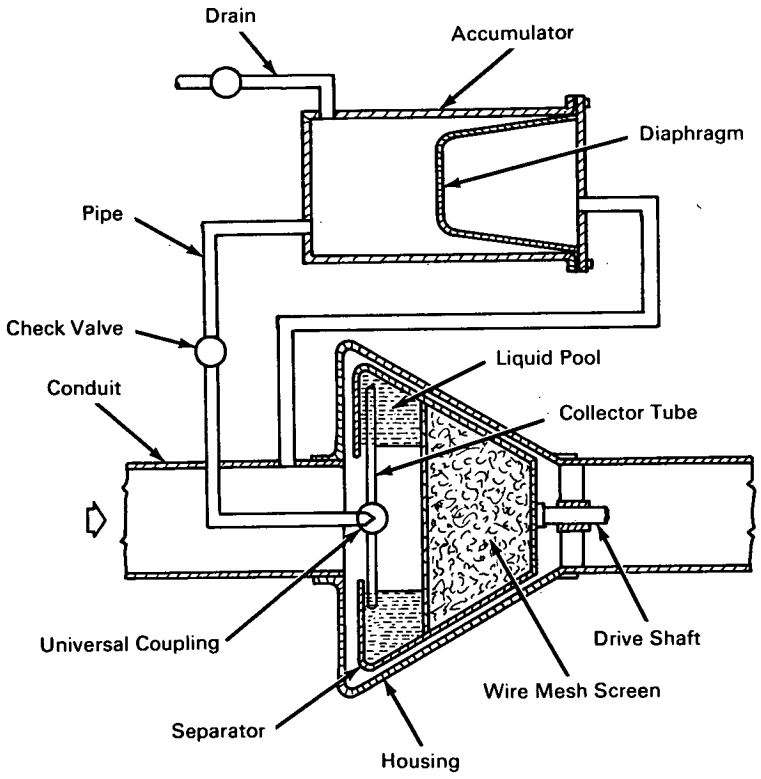
December 1965

Brief 65-10394

NASA TECH BRIEF

Centrifugal Device Separates Liquid From Gas



The problem: In certain combustion applications, as in an aircraft jet engine, performance is degraded if too large a proportion of the fuel enters the combustion chamber in purely liquid form. It is therefore necessary to reduce the liquid-to-gas ratio in order to achieve maximum efficiency.

The solution: A centrifugal separator that removes a predetermined portion of the liquid that is passing through a duct as a liquid–gas mixture.

How it's done: As the liquid–gas mixture in the conduit enters the separator, a portion of the liquid strikes the rotating wire-mesh screen, and is caused by centrifugal force to seek the largest diameter of the separator where it forms in an annular pool. Centrifugal force also causes the liquid in the pool to enter the collector tube and move through the universal coupling into a pipe that leads to an accumulator. The accumulator includes a transverse diaphragm that is exposed on one side to the stored liquid from the

(continued overleaf)

separator and on the other to gas pressure from the main conduit inlet. In this way, the separator works only against the gas pressure in the conduit.

The collector tube in the separator is designed with one portion shorter than the other so that, when the liquid level in the annular pool recedes to a point where the shorter end is no longer submerged, the longer end will act to pump liquid through the collector tube back into the pool through the shorter end. In this way, passage of gas to the accumulator is prevented and pumping of fluid to the accumulator is automatically controlled. A checkvalve in the pipe to the accumulator prevents backflow and a drain with pressure regulating valve permits system operation with the accumulator filled.

Note: The amount of liquid removed from the liquid–gas mixture is controlled by separator-screen mesh size and rotational speed.

Patent status: Title to this invention has been waived under the provisions of the National Aeronautics and Space Act (42 U.S.C. 2457 (f)), to United Aircraft Corporation, East Hartford, Connecticut, 06108.

Source: Kenneth E. Stroup and
Robert M. Handlewich of
United Aircraft Corporation
under contract to
Manned Spacecraft Center
(MSC-282)