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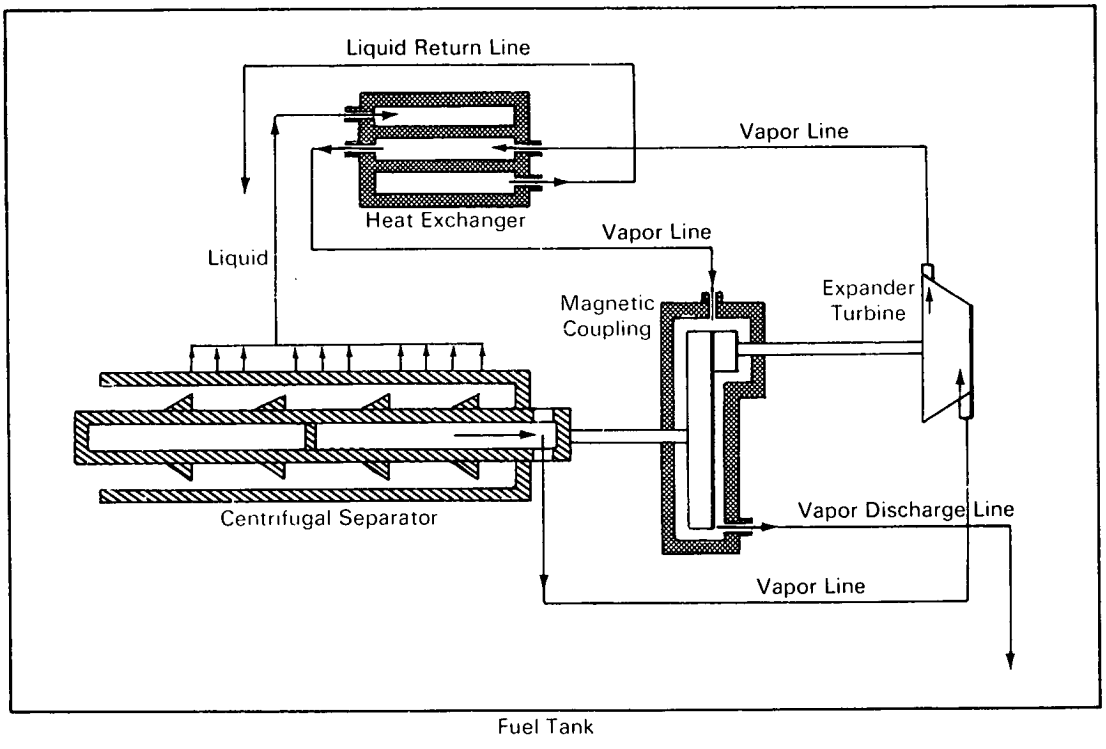
NASA TECH BRIEF

Automatic Fluid Separator Supplies Own Driving Power



The problem: In space vehicles, fuel vapor must be vented in order to prevent overpressure in the fuel tanks. At zero gravity, the location of gas vapor pockets is unknown. It is therefore necessary to design a separator that will select and vent only the vapor to insure minimum fuel loss. It is desirable to design the separator to be self-driven in order to avoid the weight penalty of an external driving medium.

The solution: A centrifugal separator suspended in the fuel tank. Escaping vapor is used to drive an expander turbine that is magnetically coupled to the separator.

How it's done: A mixture of liquid and vaporous fuel enters the inlet valve of the separator where the liquid is expelled through peripheral openings into a line leading to a heat exchanger. Vapor is expelled from the center of the separator at its discharge end and passes through a line leading to the inlet side of the expander turbine. At this point the vapor has a slightly reduced temperature and pressure from that

(continued overleaf)

at the inlet valve of the separator. As the vapor passes through the turbine, it drives the turbine and expands to a substantially reduced pressure and temperature. This expanded vapor is piped from the turbine outlet to the heat exchanger where it removes a certain amount of heat in the liquid fuel from the separator. This results in liquid fuel returning to the tank by the liquid return line in a cooler state than when it entered the separator, thus reducing the liquid content's boil-off rate. The partially heated vapor leaves the heat exchanger and passes through the magnetic coupling where it picks up additional heat as it cools the coupling and then is expelled from the system via the vapor discharge line.

Note: This invention should have wide application in ground-level storage and transport of cryogenic fluids as an economizer to save a substantial amount of liquid by heat transfer between the liquid and vaporous phases.

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 the Midland-Ross Corporation, P.O. Box 907, Toledo, Ohio, 43601.

Source: Ivans S. Spulgis, Maurice S. Decker, and Ludwig A. Majneri of the Midland-Ross Corporation under contract to Western Operations Office (WOO-085)