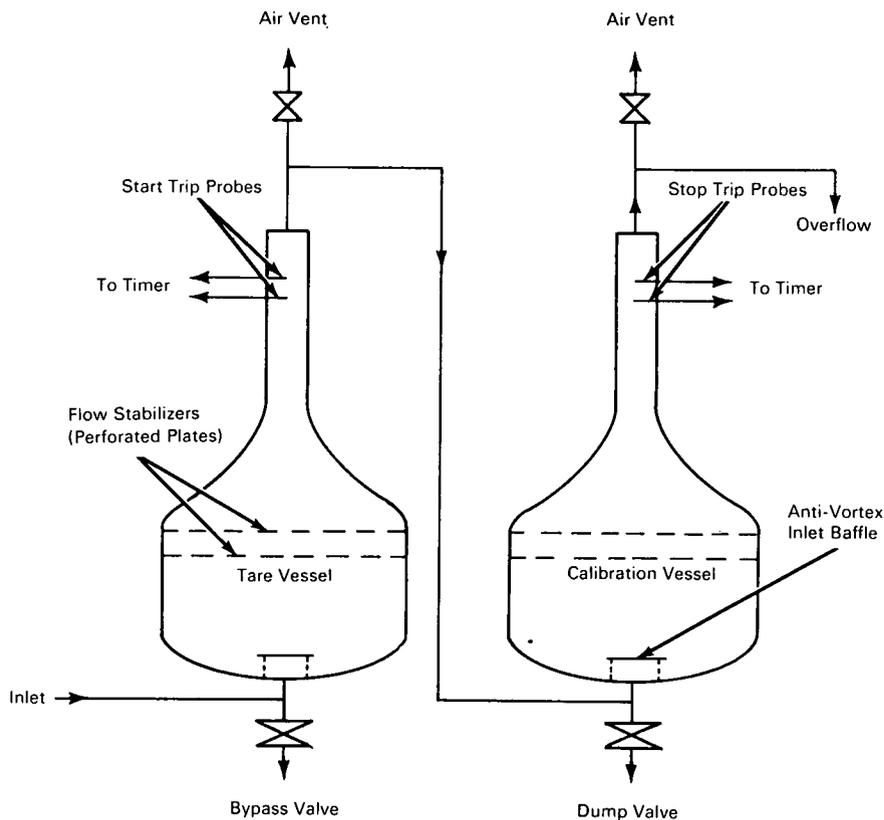


# NASA TECH BRIEF



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## Volumetric System Calibrates Meters for Large Flow Rates



**The problem:** To provide a system for calibrating meters used to measure liquid flow rates of 20,000 to 30,000 gallons per minute with a calibration accuracy of  $\pm 0.25\%$ . Conventional systems for primary calibration of liquid flow meters use gravimetric methods (weighing scales), which have a limited capacity and relatively low accuracy.

**The solution:** A volumetric system employing trip probes and equipment to time the flow of liquid from a tare vessel into a calibrated vessel.

**How it's done:** The calibration system incorporates two specially designed vessels of the desired volume. One vessel serves as a tare volume and includes trip

(continued overleaf)

probes to indicate the start of the flow past liquid-level markers; the second vessel encloses an accurately calibrated volume and includes stop trip probes. Both vessels have narrow necks inscribed with reference markers, to permit sensitive start and stop probing of the liquid levels, and flow stabilizers.

In conducting a calibration, the four valves shown in the illustration are opened. A portion of the fluid flowing into the inlet enters the tare vessel and a portion is channeled through the bypass valve until steady flow conditions are established. The operator then depresses a button to close all of the valves and begin filling the calibration vessel. As the flow passes the perforated plates in this vessel, the meniscus is stabilized and rises smoothly through the contoured section. When the flow passes across the first start trip probe in the neck of the tare vessel, automatic timing and counting equipment (used in conjunction with the flowmeter being calibrated) are started. The flow then passes into the calibration vessel and is detected by the stop trip probes when the liquid rises across them. When the last probe is reached, this action stops the timer and auxiliary instrumentation and opens the four valves, permitting both vessels to drain in preparation for the next calibration run. The volumetric flow

rate for each run is the quotient of the known (calibrated) volume between the probes in the two vessels and the measured time of flow.

**Notes:**

1. For a flow rate of 30,000 gallons per minute, a calibration run will be completed in approximately 10 seconds. The volume of the calibration vessel used in this system will therefore be approximately 5,000 gallons.
2. This calibration system should prove useful in the petroleum and chemical industries, large water-pumping stations, and desalination plants.
3. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer  
Western Operations Office  
150 Pico Boulevard  
Santa Monica, California, 90406  
Reference: B65-10323

**Patent status:** NASA encourages commercial use of this innovation. No patent action is contemplated by NASA.

Source: North American Aviation, Inc.  
under contract to  
Western Operations Office  
(WOO-130)