

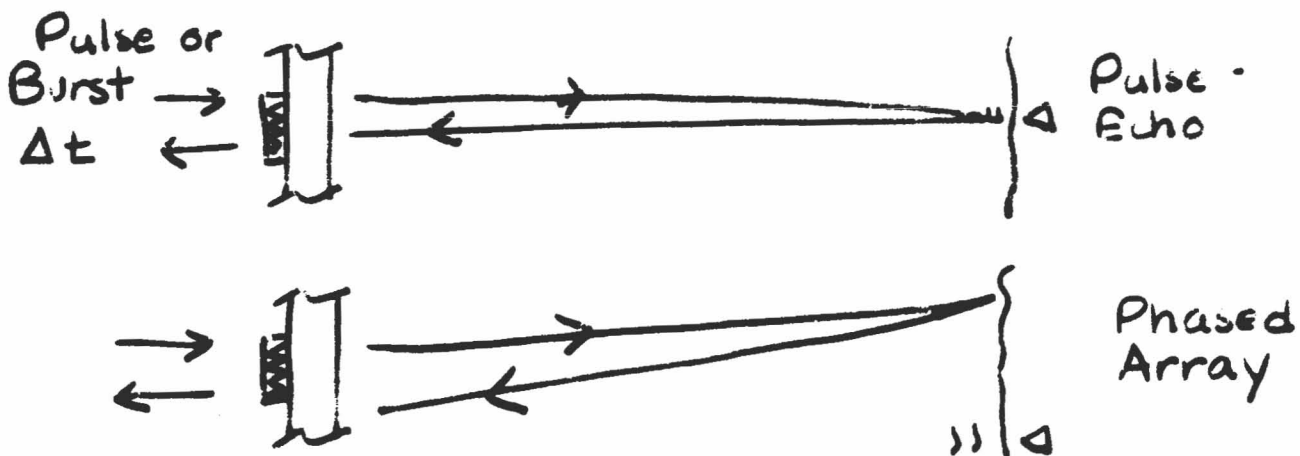
Ultrasonic Fluid Measurement

W. Durgin

Objective: Determination of liquid quantity and configuration under static and dynamic conditions.

Important for: Consumption
Resupply
Manufacturing

Methodology: Ultrasonic sounding measure distance to liquid/vapor interface.



Experiment: Utilize tank with fluid stimulant.

Vary quantity
Replaceable transducers
Various accelerations

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Issues: Assume static case with small contact angle - liquid spreads to minimum energy configuration

- Minimum number of pulse - echo measurements to determine quantity and configuration

For dynamic case resulting from acceleration, heat transfer, resupply, etc. How many are needed?

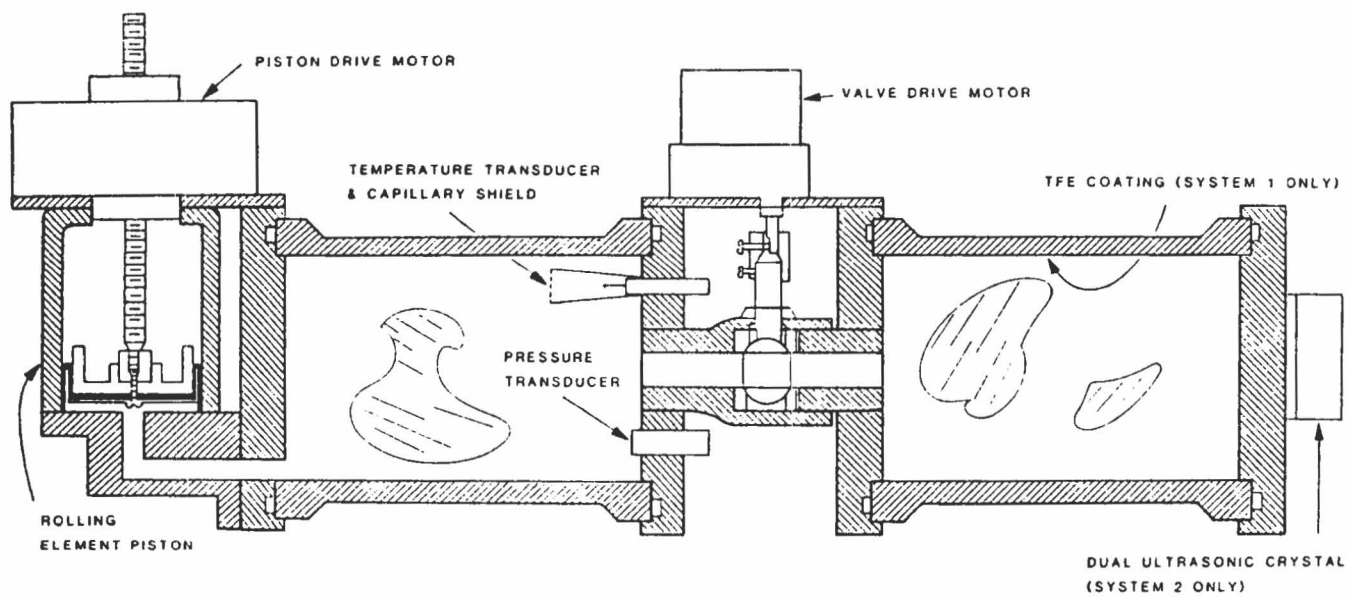
Can phased arrays reduce the number of tank penetrations?

How should baffles and acquisition devices be placed to enable measurement?

Can the liquid motion be reasonably predicted based on acceleration or other perturbation such that the number of tank penetrations can be minimized?

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Experiment for G408
Shuttle Flight 1986

Experiment Title: Ultrasonic Fluid Measurement
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Proposed Flight Date: 1989 on
Operational Days Required: 10

Mass - 250 KG

Volume: 0.25 M³

Stored: W 0.5 x L 0.5 x H 1.0 = 0.25 M³
Deployed: W same x L x H = M³

Internally Attached	yes
Externally Attached	yes
Formation Flying	no

Orientation : Specified Accelerations

Extra-Vehicular Activity Required : None

Intra-Vehicular Activity Required :

Set-up:	4 Hrs/Day	1	No. of Days
Operations:	1 Hrs/Day	10	No. of Days
Servicing:	4 Hrs/Day	4	No. of Days

Power Required :

10 KW	DC
24 Hrs/Day	10 No. of Days

Data Rate: low: Megabits / second

Data Storage: 10 Megabits