PIPE WHIP LAB

PURPOSE: The purpose is to check pipe whip theory.

SETUP: The setup consists of a small diameter plastic tube attached to a water faucet.

PROCEDURE: Increase the water flow speed gradually until the tube undergoes whip. Flow rate is determined by measuring the time it takes to collect a certain volume of water. The flow rate is just volume divided by time. The flow speed is just flow rate divided by tube area.

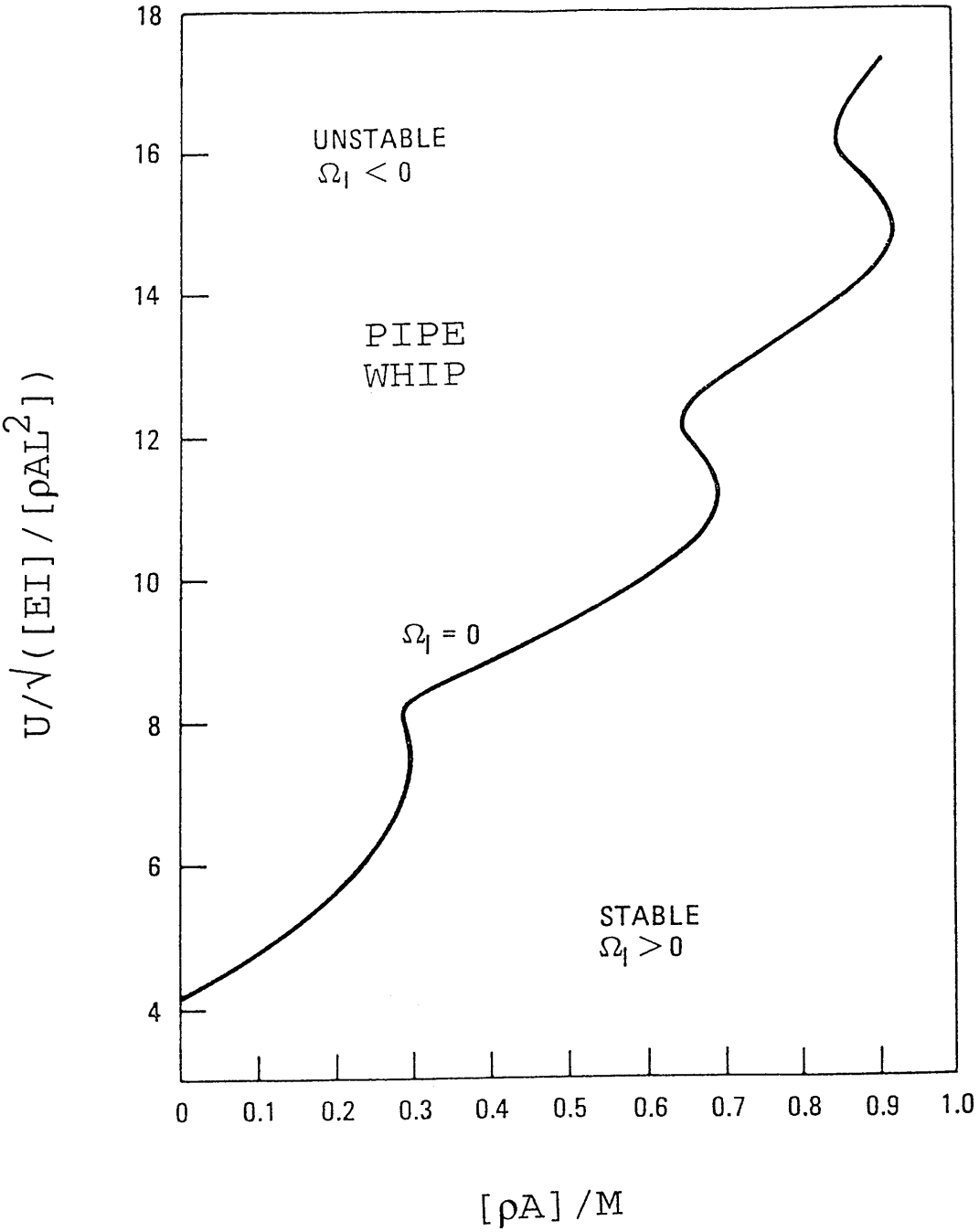
OBSERVATIONS: Compare the measured critical flow speed with the theoretical critical flow speed obtained from the Blevins plot and from the code HOSE.


RECALL
WATER RESISTANT
SPLIT MEMORY
BIOS

BACKGROUND

A critical flow speed theory for pipe whip is outlined in the text by Blevins. It uses normal modes to describe the shape of the pipe. The prediction of the theory is presented in the plot on the next page.

A critical flow speed theory which used finite element shape functions to describe the shape of the pipe is developed in the FSI notes. The FORTRAN code HOSE gives the prediction of this theory.


18
16
14
12
10
8
6
4
UNSTABLE
$\Omega_1 < 0$
PIPE
WHIP
$\Omega_1 = 0$
STABLE
$\Omega_1 > 0$
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
$U/\sqrt{([EI]/[\rho AL^2])}$
$[\rho A]/M$