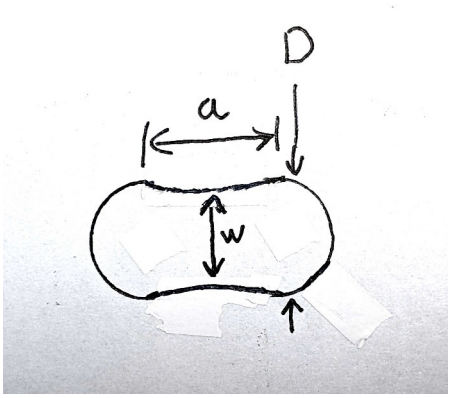
Bistable Slot Investigation

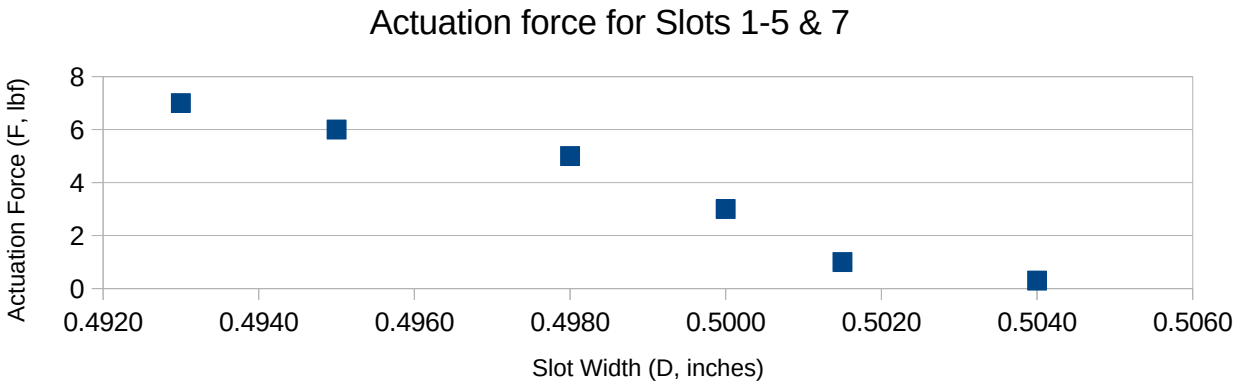
Thaddeus Hughes – 24 MAR 2025



I made seven different slots, and tested them with the same plastic insert and shoulder bolt (diameter .310”). I measured how much force was required to actuate them with a kitchen scale (this was quite rough and should not be taken as a precise measurement).

Results are as follows (dimensions in inches, forces in pounds):

ID	a	w	D	F
7	0.510	D	0.4930	7
5	0.500	D	0.4950	6
1	0.500	D	0.4980	5
2	0.500	D	0.5000	3
3	0.500	D	0.5015	1
4	0.500	D	0.5040	0.3
6	0.500	0.4955	0.4995	4
	No steel – bare plastic piece			0.3



Actuation force has a roughly linear relationship – more squeeze, more force required. Every thousandth of an inch adds a pound to half pound of force. However – once there is no longer a press fit, the force is nearly the same as if there was no steel retainer at all – about 4-5 ounces. So, some amount of press fit is desirable.

Adding a press fit can cause some difficulty in installing the slot, if the same center-to-center distance (a) is maintained. Increasing it even by 0.01” makes installation significantly easier, as is the case with slot #7.

A figure-eight shape somewhat helps installation but not as much as lengthening the slot. It performs similarly to as if the slot was just narrower.