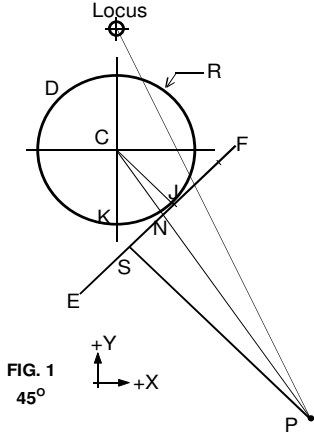


# "Plate on Ball" Study

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Rev. 0 Lower pivot plate on ball (from Rev 5 "Lehman Rolling Pivot Geometry Error Study")  
 rev 1 improve fig 2, remove prolate image  
 Rev. 2 9/5/08 Total clean up, corr.s and simplification



**Eqn derivations:**  
 Given:  
 circle D with center C and radius R  
 $C = X = Y = \text{LocusX} = \text{zero}$   
 $K = S \text{ at } aKCP = \text{zero}$   
 Beam B = SP with flat pivot surface EF at a normal  
 J is tangent point of EF on D as it rolls in contact  
 N is the intersection point of CP with FE  
 SP is always parallel to CJ  
 angles are in radians  
 then:  
 1)  $NS + JN = aKCJ * R$   
 2)  $JN/NS = R/SP$  :similar triangles  
 3)  $JN = (R*NS)/SP$  :rearrange 3)  
 4)  $NS + (R*NS/SP) = aKCJ * R$  :substitute 3) in 1)  
 5)  $NS*(1 + R/SP) = aKCJ * R$   
 6)  $NS = (aKCJ * R) / (R/SP + 1)$  :rearrange 5)  
 7)  $aPCJ = \text{atan}(NS/SP)$  :aPCJ = aCPS  
 8)  $aKCP = aKCJ - aPCJ$   
 9)  $CP = SP/\cos(aPCJ) + R/\cos(aPCJ)$

Name	Input Values	
dia	0.25000	circle D
beam	6.67000	Beam Len SP
locus	0.001200	Y value
Derived Values		
radius	0.125000	Dia/2 =
LocRadius	6.796200	

**Some solutions:**

dia	2.25000	2.25000	0.25000
beam	10.00000	6.67000	6.67000
locus	0.071680	0.114000	0.001200
ERROR uin	4	3	0

bob will lift with error -- more stable

## suspension w/ flat plate rolling on pivot

Locus Circle X	Locus Circle Y	locus angle	Diff beamY-loc Y	Swing Ang (radians)	swing degrees	NS	ang PCJ	ang KCP	CP	beam X	beam Y
0.000000	-6.795000	0.000000	0.000000	0.000	0.000	0.000000	0.000000	0.000000	6.795	0.000000	-6.795000
-1.194369	-6.689246	-0.176658	0.000000	-0.180	-10.313	-0.022086	-0.003311	-0.176689	6.79503725	-1.194369	-6.689246
-1.128650	-6.700643	-0.166844	0.000000	-0.170	-9.740	-0.020859	-0.003127	-0.166873	6.79503323	-1.128650	-6.700644
-1.062823	-6.711396	-0.157029	0.000000	-0.160	-9.167	-0.019632	-0.002943	-0.157057	6.79502943	-1.062823	-6.711396
-0.996893	-6.721501	-0.147215	0.000000	-0.150	-8.594	-0.018405	-0.002759	-0.147241	6.79502587	-0.996893	-6.721501
-0.930867	-6.730960	-0.137401	0.000000	-0.140	-8.021	-0.017178	-0.002575	-0.137425	6.79502253	-0.930867	-6.730960
-0.864751	-6.739770	-0.127586	0.000000	-0.130	-7.448	-0.015951	-0.002391	-0.127609	6.79501943	-0.864751	-6.739770
-0.798552	-6.747930	-0.117772	0.000000	-0.120	-6.875	-0.014724	-0.002208	-0.117792	6.79501656	-0.798552	-6.747930
-0.732277	-6.755441	-0.107958	0.000000	-0.110	-6.303	-0.013497	-0.002024	-0.107976	6.79501391	-0.732277	-6.755441
-0.665931	-6.762301	-0.098143	0.000000	-0.100	-5.730	-0.012270	-0.001840	-0.098160	6.7950115	-0.665931	-6.762301
-0.599520	-6.768510	-0.088329	0.000000	-0.090	-5.157	-0.011043	-0.001656	-0.088344	6.79500931	-0.599520	-6.768510
-0.533052	-6.774067	-0.078515	0.000000	-0.080	-4.584	-0.009816	-0.001472	-0.078528	6.79500736	-0.533052	-6.774067
-0.466533	-6.778971	-0.068700	0.000000	-0.070	-4.011	-0.008589	-0.001288	-0.068712	6.79500563	-0.466533	-6.778971
-0.399969	-6.783222	-0.058886	0.000000	-0.060	-3.438	-0.007362	-0.001104	-0.058896	6.79500414	-0.399969	-6.783222
-0.333366	-6.786820	-0.049072	0.000000	-0.050	-2.865	-0.006135	-0.000920	-0.049080	6.79500287	-0.333366	-6.786820
-0.266732	-6.789765	-0.039257	0.000000	-0.040	-2.292	-0.004908	-0.000736	-0.039264	6.79500184	-0.266732	-6.789765
-0.200071	-6.792055	-0.029443	0.000000	-0.030	-1.719	-0.003681	-0.000552	-0.029448	6.79500103	-0.200071	-6.792055
-0.133391	-6.793691	-0.019629	0.000000	-0.020	-1.146	-0.002454	-0.000368	-0.019632	6.79500046	-0.133391	-6.793691
-0.066699	-6.794673	-0.009814	0.000000	-0.010	-0.573	-0.001227	-0.000184	-0.009816	6.79500011	-0.066699	-6.794673
0.000000	-6.795000	0.000000	0.000000	0.000	0.000	0.000000	0.000000	0.000000	6.795	0.000000	-6.795000