James Bird
FMET Lab Report 2 - Momentum Principle and Impact of Jets
Student ID: 2212304

Introduction:

The aim of this experiment is for the students to study and understand the behaviour of water jets impact on surfaces and the application of the momentum theory to fluid flows. In this experiment the students will use the data from the practical to calculate the experimental and theoretical force. For the students to do this they will have to use equations using velocity, force, the flow rate, density, and area.

Method:

The students will start off by making sure the apparatus is correctly set up for use, then they will need to make sure there is no flow condition by moving the weight along the axis, so the spring balance is levelled. Next the students will switch on the device and start off by turning the flow rate to a maximum which will turn the balance out of level. Once the flow rate is at the maximum, move the weight again so the spring balance is again levelled and record the distance from the previous level position to where it is now additionally recording the force and flow. The students will then lower the flow rate and once again rebalance the spring and record the distance and repeat this until you reach the minimum flow rate. Once the students have all the data, they can begin to calculate the theoretical and experimental forces and plot graphs for this data.

Data:

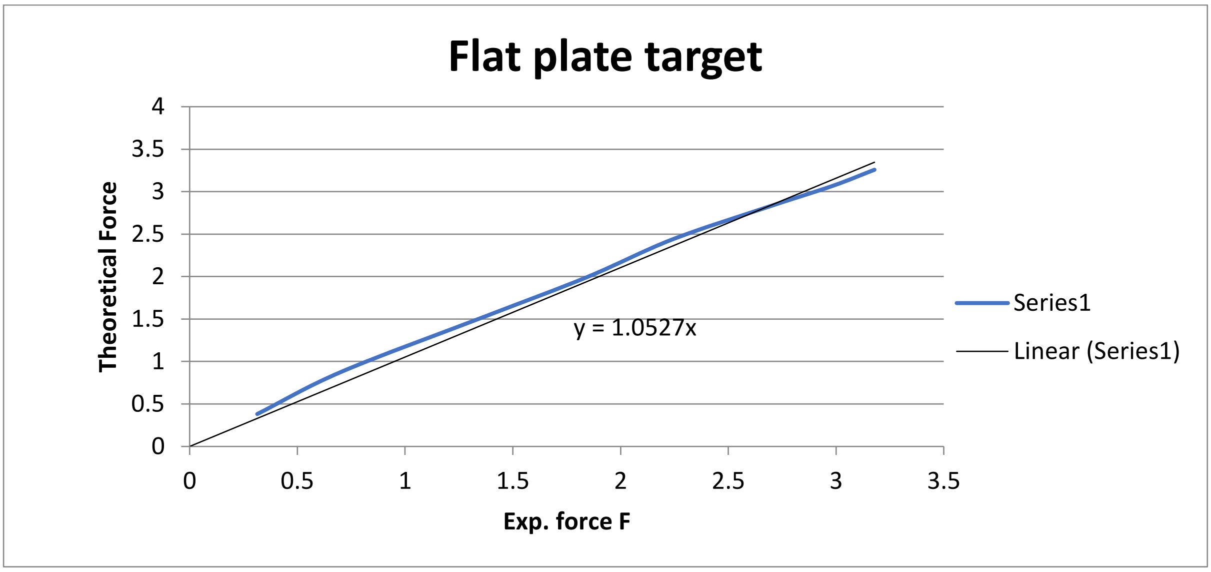
Nozzle diameter (m)	Nozzle area A (m2)	z (m)	m (kg)
0.01	7.85398E-05	0.035	0.6

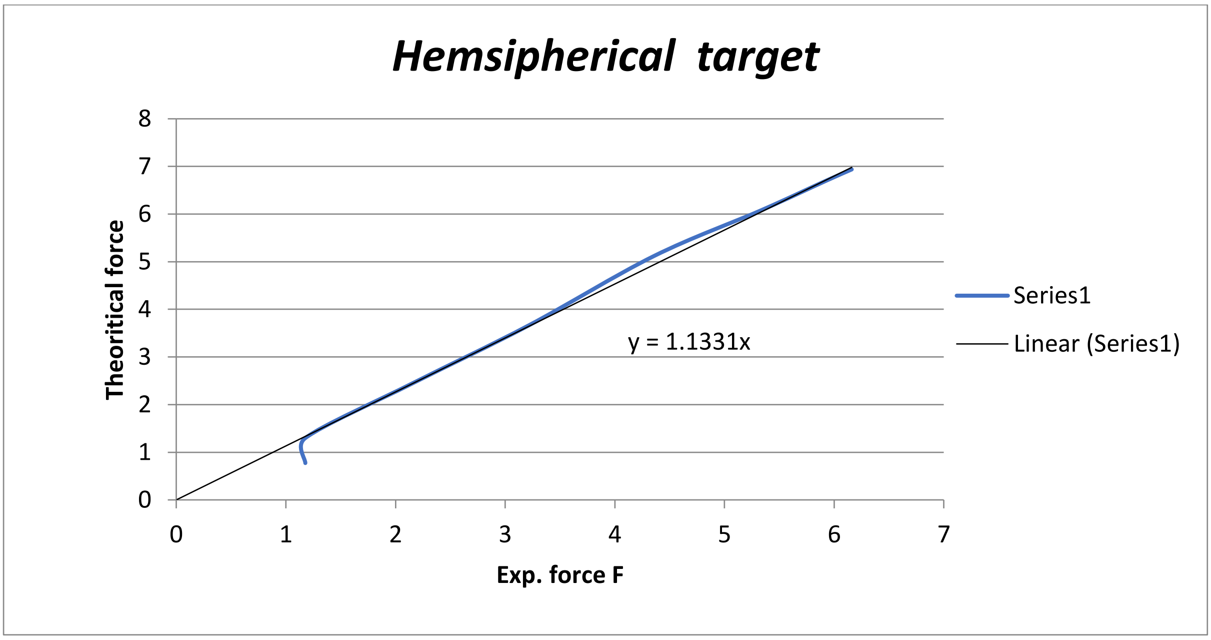
James Bird
FMET Lab Report 2 - Momentum Principle and Impact of Jets
Student ID: 2212304

Line	x (m)	$F = mgx/0.15$ (N)	Q (m^3/s)	$u_n = \frac{Q}{A}$ (m/s)	$u = (u_n^2 - 2gz)^{0.5}$	$\rho u^2 A\ (N)$
1	0.081	3.17844	5.10E-04	6.49352168	6.44042885	3.257762764
2	0.076	2.98224	4.95E-04	6.30253575	6.24782017	3.065821903
3	0.068	2.66832	4.74E-04	6.03515544	5.97799308	2.806730388
4	0.057	2.23668	4.42E-04	5.62771879	5.56637393	2.433518412
5	0.047	1.84428	4.01E-04	5.10569057	5.03799328	1.993448628
6	0.035	1.3734	3.53E-04	4.49453559	4.41748234	1.532637772
7	0.018	0.70632	2.71E-04	3.45047917	3.34949347	0.881146562
8	0.008	0.31392	1.85E-04	2.35549316	2.20491451	0.381832942

Line	x (m)	$F = mgx/0.15$ (N)	Q (m^3/s)	$un = Q/A$ (m/s)	$u = (u_n^2 - 2gz)^{0.5}$	$2\rho u^2 A\ (N)$
1	0.157	6.16068	5.26E-04	6.69724001	6.64577487	6.937629902
2	0.151	5.92524	5.17E-04	6.58264845	6.53028028	6.69859191
3	0.136	5.33664	4.93E-04	6.27707096	6.22213145	6.081325378
4	0.111	4.35564	4.53E-04	5.76777514	5.70793571	5.117737691
5	0.082	3.21768	3.85E-04	4.90197225	4.83142131	3.666652047
6	0.055	2.1582	3.17E-04	4.03616936	3.9501852	2.451064788
7	0.03	1.1772	2.35E-04	2.99211293	2.87507214	1.298426493
8	0.017	1.1772	1.86E-04	2.36822555	2.21851127	0.773113322

James Bird
FMET Lab Report 2 - Momentum Principle and Impact of Jets
Student ID: 2212304





Discussion:

From my data the gradients given where slightly above the target of one, this could be due to many different reasons one being human error whilst recording the data due to us having the read off the ruler manually, we could improve this by recording the distance digitally. Or perhaps whilst calibrating the apparatus which can cause small inaccuracies during the experiment. Another reason our experimental and theoretical results could have been different could be that during the experiment was that the flow rate may of not of been constant during recording the data and the area acting on the plate will not be the same as the area we calculated in our results causing inaccuracies.