



MULTI HEAD PROPULSION DEVICE



BACKGROUND:

Chris Hewatt of Denver, CO developed a theoretical concept for a novel propulsion device. This device utilizes the principles of centrifugal force and conservation of angular momentum to create forward thrust. Potential applications for this device would most likely be boats and wheeled typed vehicles.

The device would utilize an electric motor or combustion engine to power a shaft mounted vertically on a vehicle. Attached to this rotating shaft is a rigid horizontal arm at the tip of which is an independent vertical axis. This axis supports an independent body which maintains its orientation relative to the vehicle regardless of the supporting arm orientation.

The theory behind this novel device is a forward thrust force is generated when the independent body becomes rigidly affixed to the rotating arm. The purpose of this project is to mathematically calculate the thrust potential of the device. The device will be kept to its most basic form and will not take into account the workings of the device. A basic overview of the conceptual device can be viewed in Figure 1.0 along with its corresponding coordinate system.

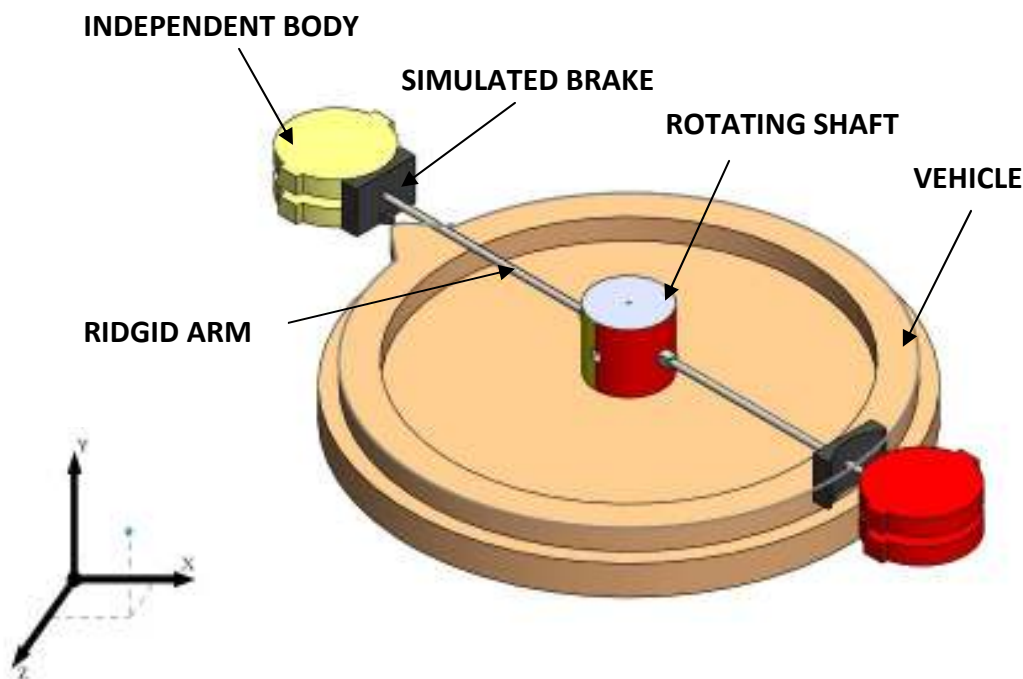


Figure 1.0 Multi-Head Experimental Propulsion Device



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Prairie West LLC performed an initial analysis on this concept and concluded the concept had fundamental merit. One observation was a single independent mass design is not dynamically balanced and results in eccentric loading. This eccentric loading creates extensive vehicle vibrations and would overpower the thrust force generated by the independent mass. A dynamically balanced concept was briefly analyzed and found to produce a much cleaner thrust force with minimal vibration. The work performed for this report was focused on gaining a greater understanding of how a design consisting of multiple independent masses would affect overall thrust force potential.

OBJECTIVES:

The primary objective of this project phase is to update the SolidWorks simulation model to accept multiple independent mass braking systems. The model will be updated with an improved braking simulation method and will be configured to easily go from 2, 4 and 8 mass systems. With this updated model multiple 100 lbm masses will be rotated at 30 RPM and analyzed for thrust force potential.

METHODS:

The primary tool utilized will be a 3D kinetic body simulation utilizing SolidWorks CAD software combined with the SolidWorks Motion simulation package. This package is a very powerful tool to assist in visualization the forces and actions taking place in a complex kinetic body. Figure 2.0 represents a top view of this model.

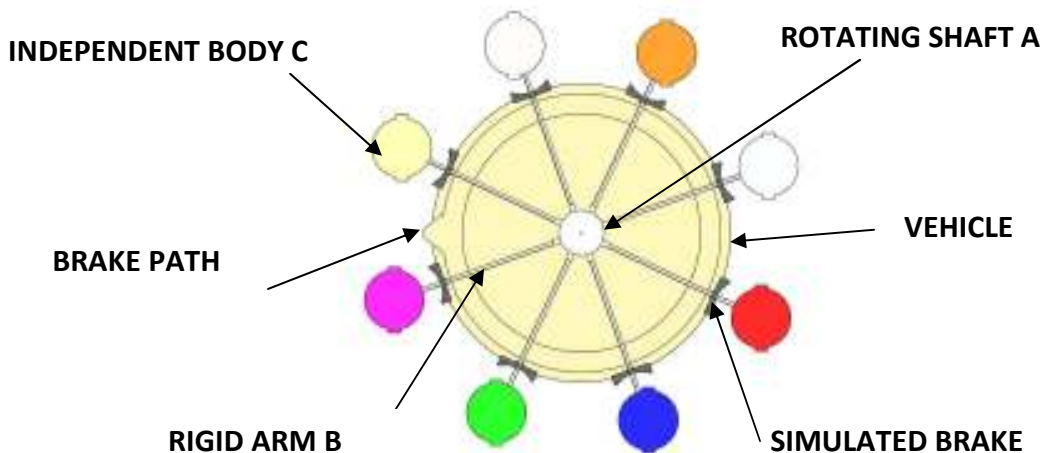


Figure 2.0 Layout View of SW Kinetic Model



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The solid body volume of the rotating shaft and independent body were set to 1.0 cubic inch such that the assigned density of the part would be equal to the desired weight of the body. The vehicle, rigid arm and simulated brake were all assigned an extremely low density to give them a negligible weight relative to the whole system.

Once the model was created a constant velocity motor feature was attached to the rotating shaft, a contact feature with a Coefficient of Friction value of 1.0 was created between the brake and independent body, and a z direction reaction force measurement was assigned along the rotational axis of the primary shaft.

The model was subsequently run with 2, 4, and 8 dynamically balanced 100 lbm independent mass and brake systems. Each configuration was rotated at a constant 30 RPM and the thrust force results exported to Excel.

RESULTS:

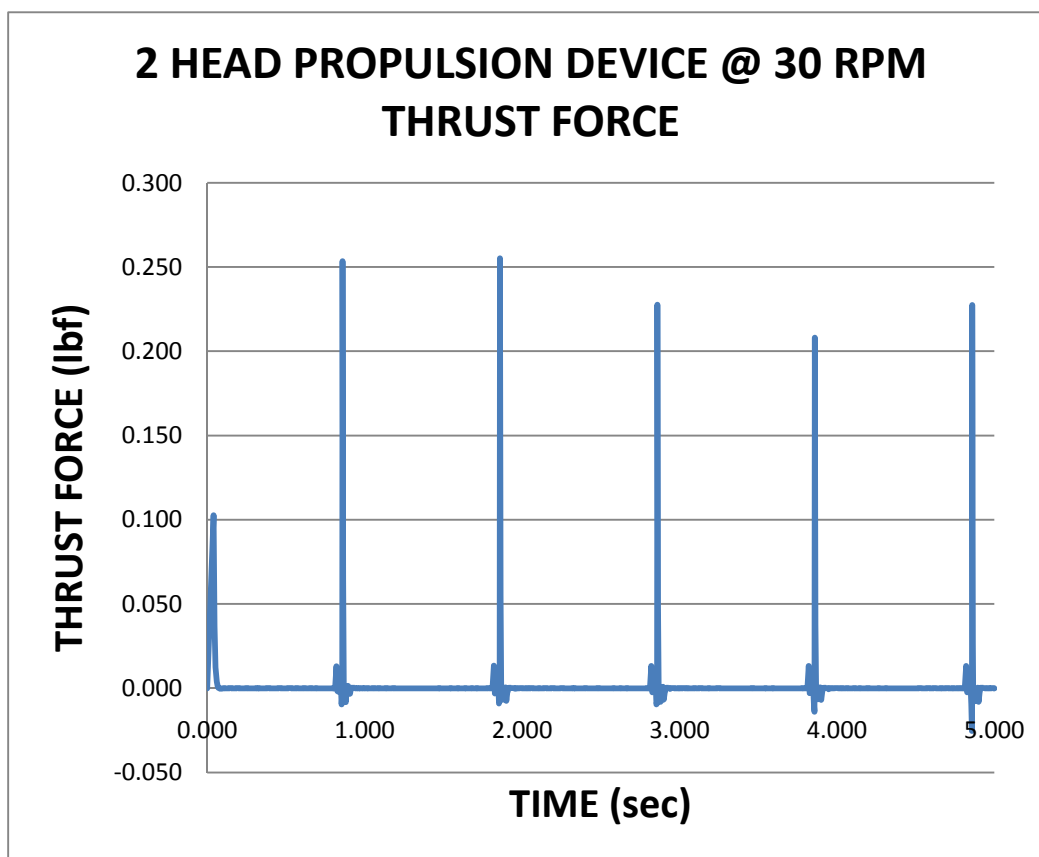
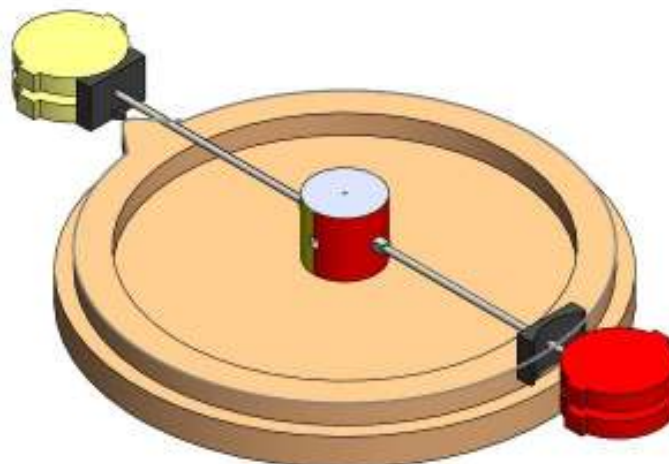
Upon review of the results you will notice a thrust force occurs when the brake engages independent axis C at the desired location. The results vary slightly from one mass to another. It is believed these variations are a result of software limitations resulting from data points taken at discrete points in time. The force generated by the braking system results in an impulse load applied over a short period of time. Since the software takes a measurement at discrete points it may not always capture the peak force of each impulse. You can reference the included data tables, charts, and video files to gain a greater understanding of the results.

When viewing the charts you will see momentary spikes in the propulsion force value which coincides with the force generated when the brake is applied to Independent Body C. In order to obtain a straight-line force the duration and orientation of this impulse brake has been strategically applied and released.

In summary a multiple head mass and braking system design provides a means to dynamically balance the rotating assembly while providing multiple thrust pulses per revolution. These multiple thrusts per revolution will smooth out the performance of the device and will ultimately create a more energy efficient system.

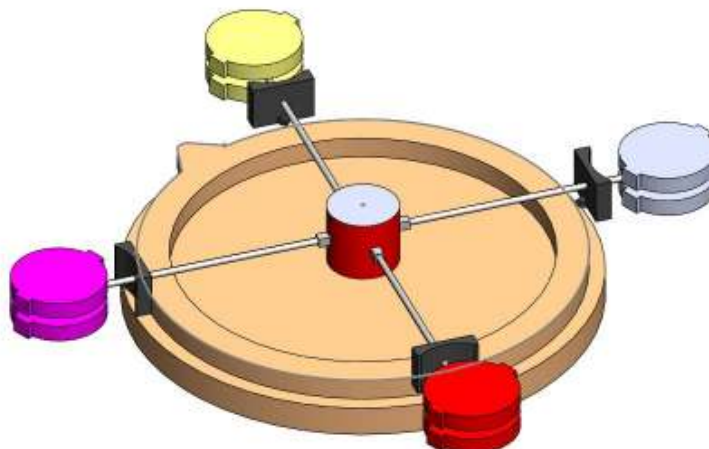


TWO HEAD PROPULSION DEVICE RESULTS

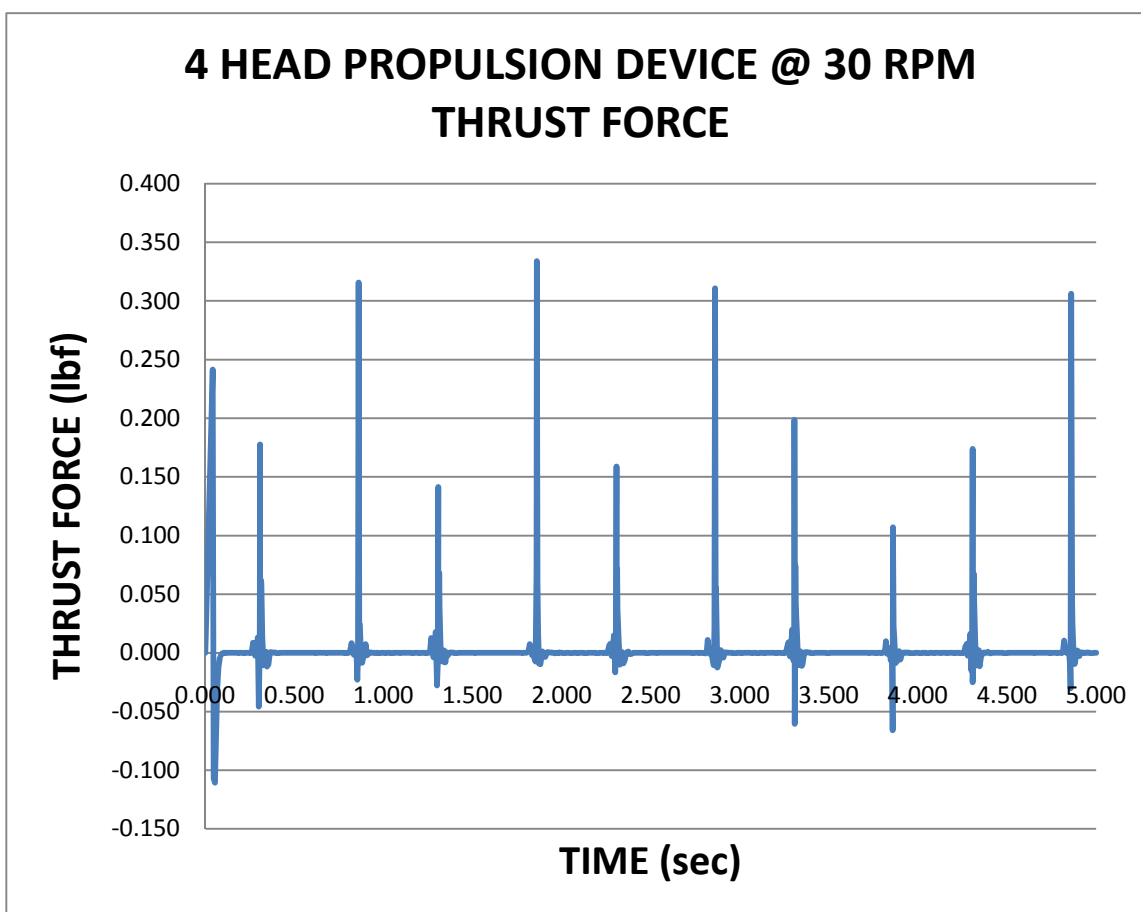




FOUR HEAD PROPULSION DEVICE RESULTS



**4 HEAD PROPULSION DEVICE @ 30 RPM
THRUST FORCE**





EIGHT HEAD PROPULSION DEVICE RESULTS

