

# **Fly Rollers Client Interview and Specifications Transcript**

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## **Client Interview**

On September 24, 2015, Team Fly Rollers met with their clients Dr. Michael Santora, Dr. Herbert Hess and instructor Feng Li to discuss the specifications of the Lunar Flywheel Energy Storage Device.

This interview consisted of two parts: first, understanding the current state and capabilities of the Flywheel device and second, the design goals expected to be achieved by May, 2016.

The flywheel is currently controlled by a set of microcontrollers designed to keep the rotor in position so that it does not collide with either the stator or the housing. The controllers are acting independently of each other and act on coils located at the top of the stator. All the positioning software for this project is complete. Cooled superconductors at the base of the system are used to levitate the rotor. Almost all mechanical aspects of the design are available but are not currently assembled. This includes all the equipment needed to create and sustain a vacuum around the flywheel.

In terms of needed designs, the main improvement required is to get the flywheel spinning in a controlled manner. This would involve programming a few more microcontrollers with algorithms that regulate the angular velocity and acceleration. Ideally, the angular acceleration should be able to reach its peak velocity (2500RPM) in less than two weeks. The algorithms are to be designed to decipher the angular velocity by monitoring the current flow in the motor. Also, it is desirable that one controller function as a master and the others as slaves.

## Specifications

Object	Function	Target	Priority
Flywheel	Accelerate to max speed	2500 RPM	HIGH
	Reach max speed in 14 days	$0.003\text{rad/s}^2$ (requires 1 day)	HIGH
	Accelerate efficiently	70% energy efficient	MED
	Keep coils cool	Under $100^\circ\text{C}$	MED
	Eliminate air friction	Maintain a vacuum	MED
Microcontrollers	Implement speed control	Maximum steady-state offset of $2\text{rad/s}$ from set value	HIGH
		Ensure a minimum $500\mu\text{m}$ distance between the stator and rotor	HIGH
		Maximum overshoot of $10\text{rad/s}$	MED
		Maximum settling time of 1 second	MED
		Maximum rise time of 10 seconds	MED
	Manual acceleration control	Allow user to set acceleration	HIGH
	Allow for communication between controllers	Program one master and the rest slaves	MED

Approved by Michael Santora

Signature: \_\_\_\_\_

Date: \_\_\_\_\_