

Team #:	P16221	Team Name:	FSAE Damper Dynamometer
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ID	Category	Risk Item	Effect	Cause	Likelihood	Severity	Importance	Action to Minimize Risk	Owner
R1	Resource	Unable to obtain actuator for design	Inability to import track data	Actuators are very expensive. If we can't get one donated, our design would not meet all initial customer requirements.	2	0	0	Work with customer on design limitations so they understand why we can't meet their requirements.	Team
R2	Technical	Data transfer between PC and Dyno	sluggish response on dyno	Poorly written interface overhead	0	2	0	Most of the data processing happens on the microcontroller. Only transmits 1 row of data every 500 ms.	Team
R3	Technical	Sturdy design	Poor measurements, structural failure	of forces on sensors or structural components.	0	3	0	Verify calculations, FEA, fatigue and vibration calculations	Sal
R4	Technical	Control loop feedback design	Can't detect failures or repeatable movements, or too slow	microprocessor too small, algorithm design is poor.	0	3	0	The team has switched to using an Arduino Due microprocessor. It is a 32-bit processor running at 84 MHz. It has the power to perform all of our data collection and analyze it on the fly. Communications to the PC will be every 500 ms with a small amount of data.	Aung
R5	Resource	Costs exceed budget	Can't purchase necessary components	Component costs exceed predicted budget	0	3	0	The team has secured sponsorships from RIT Baja, RIT EVT, and RIT Hotwheelz. We also expect to secure a donation from BERG racing. We have also purchased used parts and found several expensive components in the scrap bins.	Team
R6	Technical	PC disconnects from dyno during run	Loss of data or control of dyno	PC crash, bad USB cable, failure of interface.	0	1	0	Dyno detects loss of connection and stops. PC interface also detects a loss of communication and alerts the user.	EE Team
R7	Safety	Pinch points due to moving parts	Personal injury	Moving components insufficiently isolated from operators or observers.	0	3	0	Keep moving parts behind panels or install guards around them. Add warning labels. Safety interlock circuit.	Andrew
R8	Safety	Damper fails during test	Airborne debris could potentially injure operator or others	Component failure of test subject.	0	1	0	Design and install safety shields, safety interlock circuit, and emergency stop button.	Sal, Jim
R9	Safety	Dyno starts when operator is installing test unit.	Injury to operator; damage to damper or dyno	Control circuit bug, someone accidentally presses start on GUI.	0	3	0	Safety interlock circuit and guards prevent power from even getting to motor if one is opened.	Jim
R10	Technical	Loads higher than expected	Physical failure - Mast or actuator linkage.	Bent shock, overcharged or mis assembled shock.	0	3	0	Worst case impulse load is well within the margin of safety. Currently have better than 2x margin of safety.	Sal, Chris
R11	Technical	Shock Clevis	Shock falls out or slips	Poor design or wear	0	2	0	Add factor of safety. Model design.	Chris
R12	Technical	Sensors miscalibrated	Incorrect measurement results	Not calibrating sensors prior to starting test.	0	1	0	Prevent: Create calibration Instructions. Have GUI routine to calibrate sensors before each run.	Jim, Aung
R13	Technical	Adjustable Mast moves during test	Incorrect measurement results	Poor locking design or operator fails to lock it.	0	1	0	Verify through testing of max load that locking mechanism works.	Sal
R14	Technical	Sensor failure during test	Loss of data	Component failure, wire breaking	0	1	0	Have software detect failure and decide how to react.	EE Team

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R15	Environmental	Erroneous data generated	Incorrectly tuned damper and FSAE loses race	Improper calibration; improper operation; failure of sensors.	0	2	0	Operation manual; sensor calibration routine; sensor failure detection.	Team
R16	Environmental	Need more than 4' x 4' of floor space	Won't fit in RIT shop	Actuation design needs space	0	2	0	Examine alternate design solutions and work with customer on expectations.	Sal
R17	Resource	May not have LabVIEW license.	More difficult to code the GUI in an open-source language.	High cost of LV license	0	2	0	Using C# with the free version of Visual Studio 15. No licensing fees.	Jim
R18	Technical	Internal power supply fails	Loss of control of dyno. Actuator may continue on last setting.	Power supply component failure	0	2	0	Designed actuator circuit so that it de-energizes when power supply fails.	Aung, Jim
R19	Environmental	Damper reservoir fails	Potentially small oil spill	Reservoir fails and leaks	0	1	0	Design the dyno to be easily cleaned and contain a spill if it occurs	Andrew
R20	Technical	Loads higher than expected	Load cell damage	Bent shock, overcharged or mis assembled shock.	0	1	0	200% load overprotection on sensor built in (up to 5000 lbs of force) which is >3 margin of safety.	EE Team
R21	Resource	Power requirements	Limits use locations	220 v, 3φ AC power not available everywhere on campus.	1	0	0	Limited to use in industrial rooms	Jim
R22	Technical	Motor overheating	motor failure	Mechanical fan doesn't spin fast enough	0	1	0	Have electric fan for cooling motor. Will test temperature during motor qual test. Motor controller also protects against motor overheat.	Jim, Sal
R23	Technical	Actuation seizes	damage to motor or other components	Damper seizes, linkages bend, bearing failure	0	3	0	Motor controller has a stall detection circuit and will shut the motor off.	Chris
R24	Technical	Shock not fitting with interface	Can't run test	Clevis not adjustable to damper or shock body interferes with stand	0	3	0	Removable clevises and 1" clearance between mounting and stand. Clevises can be custom made for each team's shock sizes and easily changed	Chris
R25	Technical	Linear bearing off-axis loading unknown.	linear bearing could bend	Calculated loads will have to be verified at test.	0	3	0	their spec sheet. Verified with our calculations to be able to handle the forces. Reduced the budget by \$300.	Chris
R26	Technical	Can't interface RS-232 to dyno	Can't control the dyno or save data	Built-in .NET interface for RS-232 has bugs.	0	3	0	Investigating alternate library use or ability to use low-level commands.	Jim
R27	Technical	Cross bar manufacturing	Program cut a random line in the crossbar.	Unknown	0	3	0	Need to determine root cause and remanufacture crossbar.	Andrew
R28							0		
R29							0		
R30							0		