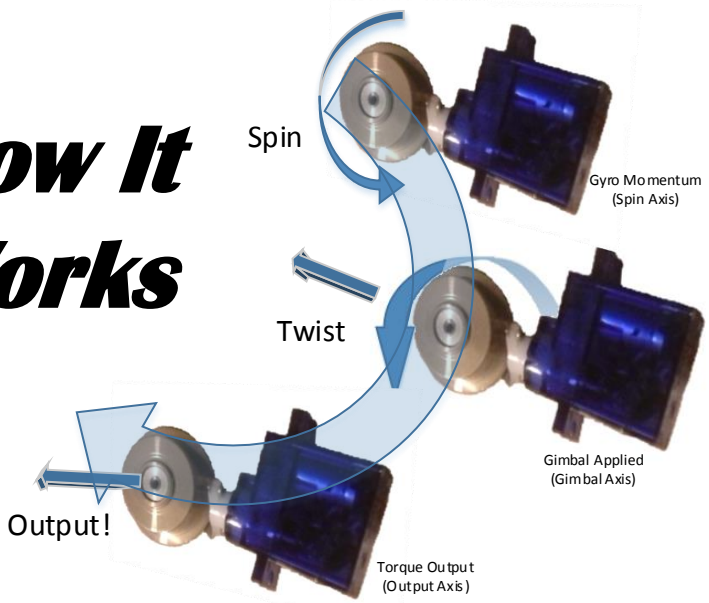
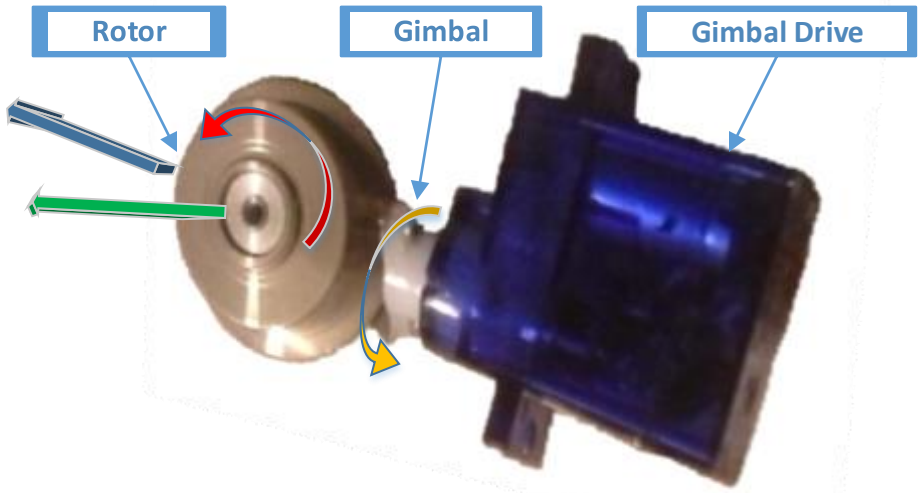
COSMOneer

Single Gimbal Control Moment Gyro

How It Works



Parts of a CMG



Parameter	Unit	Value
Mass		
Gyro Flywheel	g	8.84
Complete Assembly	g	23
Dimensions		
Gyro Flywheel	mm	24.62
Servo	mm	27x12x30
Complete Assembly	mm	54x26x34
Wire Length		
Gyro Motor	mm	70
Gyro Controller	mm	55
Servo	mm	150
Operating Voltage		
Gyro Motor	v	5.5
Gyro Controller	v	3.3-4.2
Servo	v	4.8
Operating Current		
Gyro Motor	mA	145
Gyro Controller	mA	20
Servo (no load/load)	mA	50/250
Rotation		
Gyro Speed (@ 4.7v)	rpm	
Servo Speed (@ 4.8v)	deg/sec	60/0.1
Servo Sweep Range	deg	170
Induced Torque		
CMG (@ 4.3v)	mNm/s	
CMG (@ 3.7v)	mNm/s	
Temperature Range		
Complete Assembly	degC	0-55

Physics, it's the law and we must obey it!

The Cosmoneer CMG obeys the law of conservation of angular momentum. Due to the momentum in the spinning rotor (red arrow), when you apply rotation at the gimbal (orange arrow) you get an output torque (green arrow.) This output torque is NOT thrust, but is simply rotation transferred from one axis to another.

The Cosmoneer takes advantage of this transfer of momentum and uses it to perform maneuvers in a single axis.

http://cosmospioneering.com/product/single-gimbal-control-moment-gyro/

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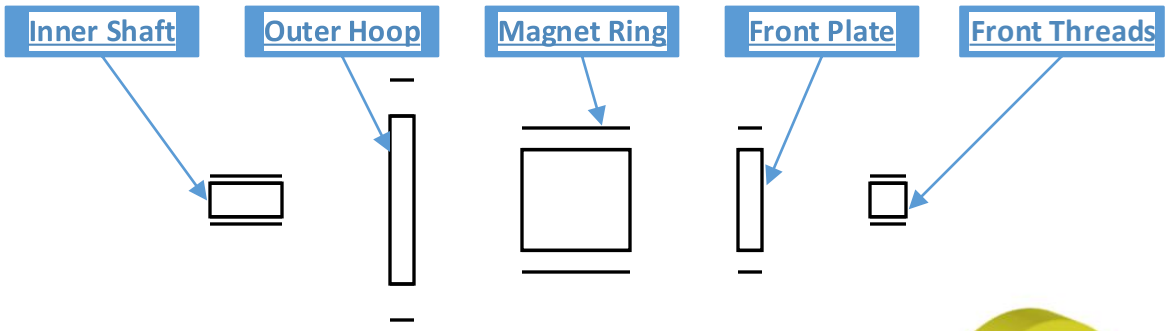
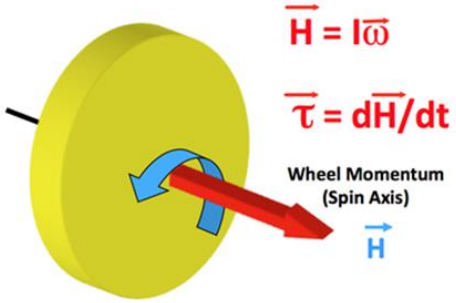
Flywheel Component Breakdown





To simplify calculating the Moment of Inertia for the Cosmoneer CMG, we destructively broke it down into five distinct, measurable parts. Since all of the individual parts had holes in the center, we opted for the formula that incorporated the inner and outer radii. With known values in hand, we applied them to the formulas below to arrive at the torque outputs listed.

Calculations and Usage

	Millimeters					I=1/2(M((ID*.5)^2+(OD*.5)^2))	
Item	**ID**	**OD**	**Radius**	**Length**	**Mass (g)**	**MOI - Method1**	**Units**
Inner shaft	6.95	7.59	3.635	5.58	0.95	12.57688375	
Outer Thin Hoop	19.72	24.62	11.085	0.86	1.26	156.716091	
Magnet Ring	16.2	19.72	8.98	7.12	4.59	373.693932	
Front Ring/Plate	6.95	19.72	6.6675	0.88	1.8	98.3657025	
Front Threaded Ring	6.95	9.45	4.1	1.21	0.24	4.12815	
				grams	8.84	645.4807593	gmm^2
						6.45481E-07	kgm^2 (Nm)
						0.000645481	mNm
						0.000270219	r (mm)

NOTE: More torque output will be obtained the slower you apply rotation to the gimbal. In addition, more torque will also be produced the more RPMs are being applied to the rotor.

Conversely, the faster you apply gimbal rotation, the less torque will be output, and, lower RPMs will produce lower torque output as well.

Angular Momentums

	= I * w (w=RPM * 0.10472)	
RPM	**Velocity**	**Units**
1000	0.067594745	mNm /sec
2000	0.13518949	mNm /sec
3000	0.202784235	mNm /sec
4000	0.27037898	mNm /sec
5000	0.337973726	mNm /sec

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