



School of Electrical Engineering and Telecommunications

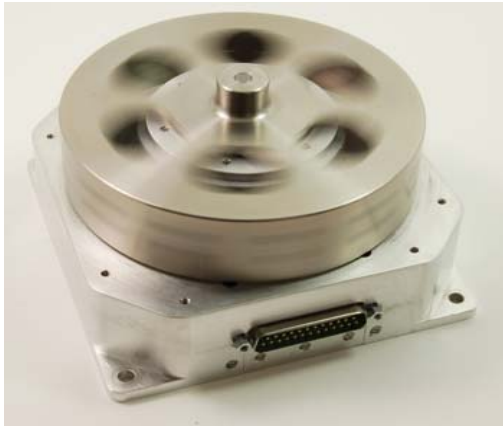
# Development of an Open-Source CubeSat Reaction Wheel System

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BLUEsat ADCS Team Lead

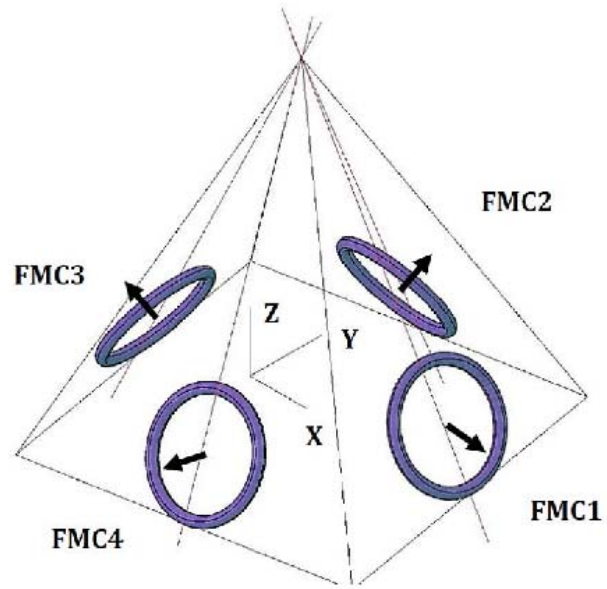


# Reaction Wheels



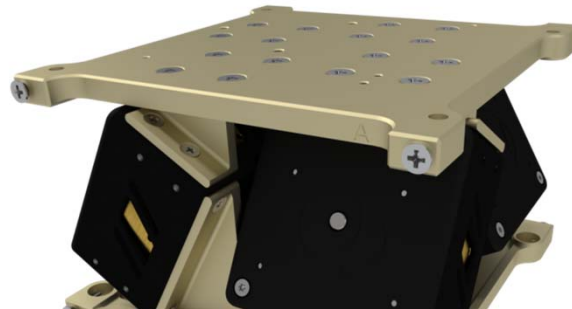
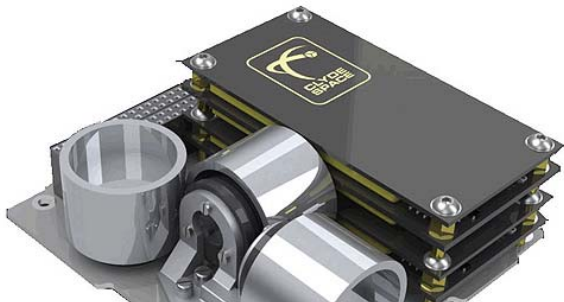
Single Reaction Wheel

*Image Source: Clyde Space*



Pyramid Configuration for Four Wheels

*Image Source: J.Tayebi, D.Soleymani*



# Commercial Reaction Wheel Systems

Commercial products:

reliable

optimised

high cost

is a big issue for smaller satellite developers!

Option: Open-source hardware



ADCS-TM: \$19,869

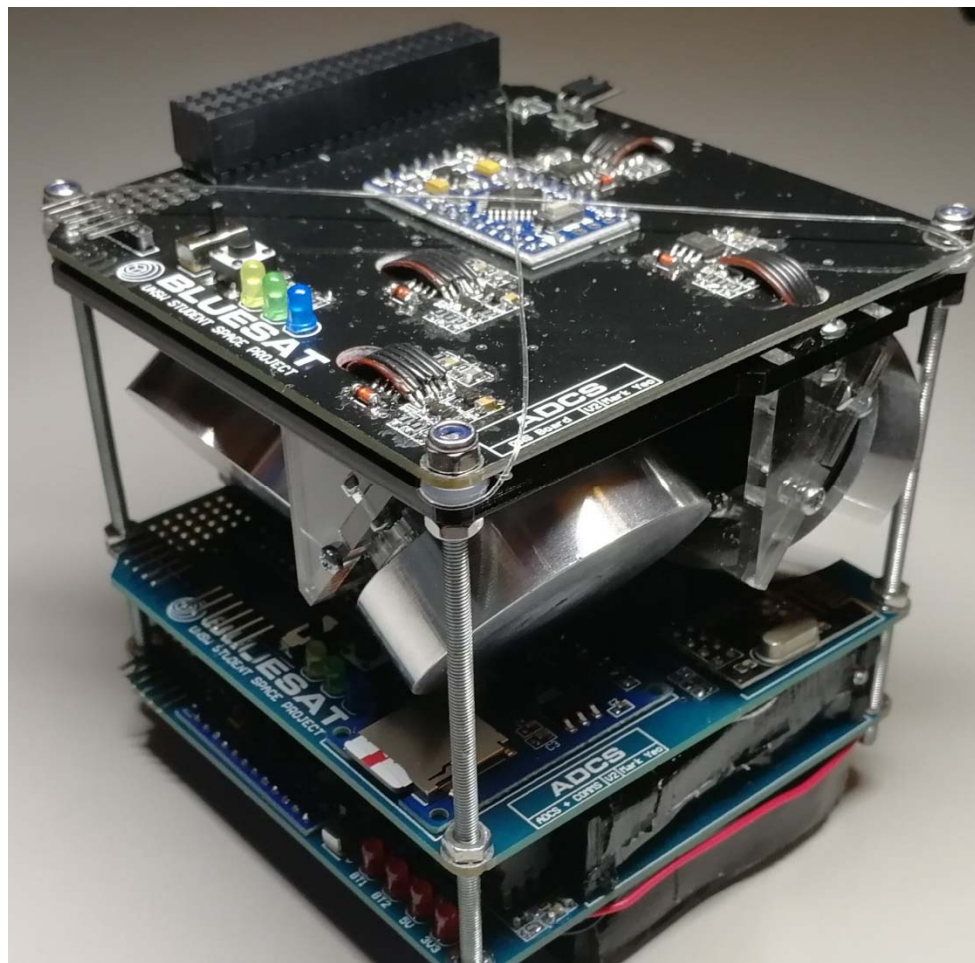
*Image Source: Clyde Space*



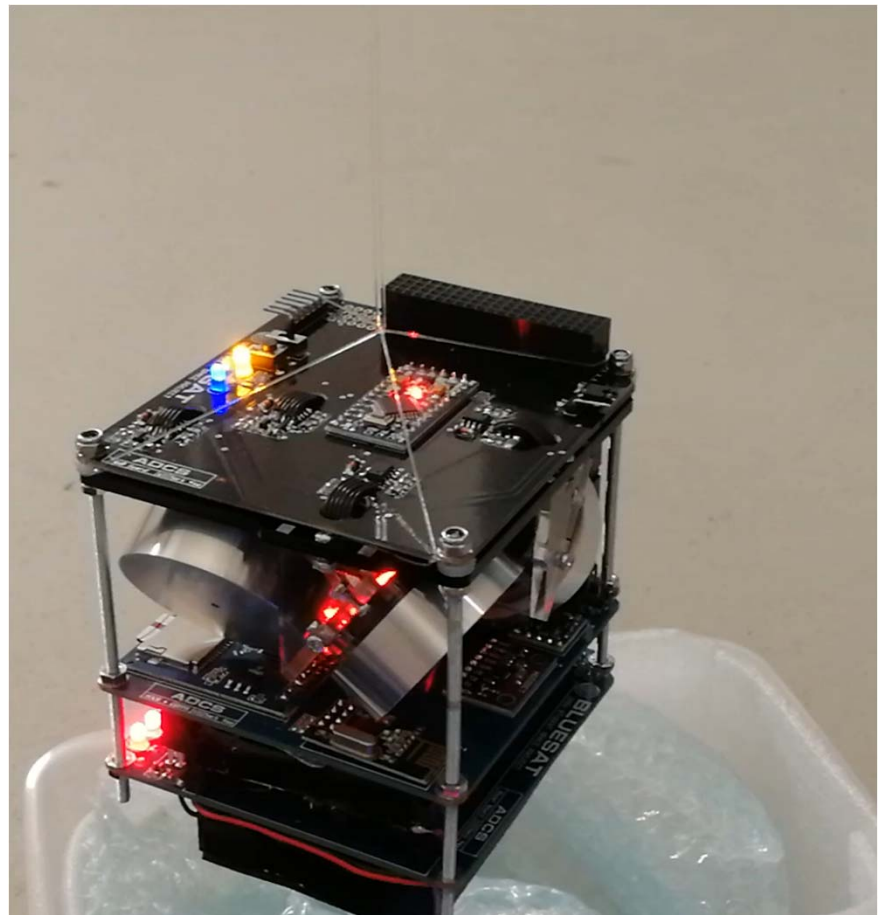
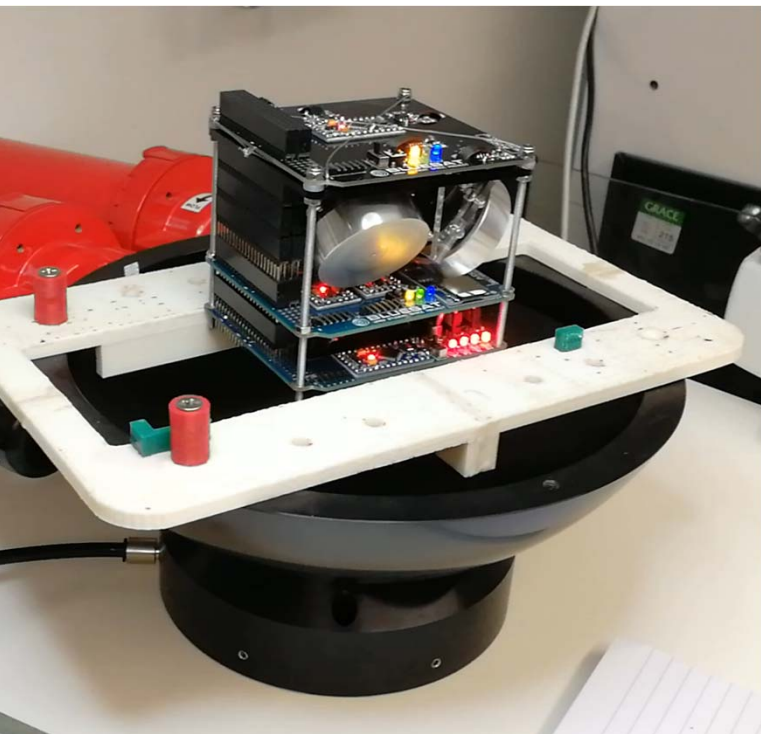
# e Design



Rendered Reaction Wheel System



# Performance Testing



# Comparison to Commercial Designs

Design advantages:

Customisable design (e.g. wheel tilt angle, wheel weight + geometry)

Cost (<\$1000)

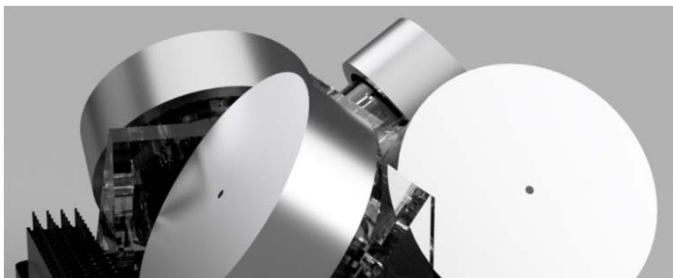
Design disadvantages:

Exposed reaction wheel units

Wheel balancing



Commercial (Orange) vs. Prototype (Blue) Cost



# Future Work

ent applications:

useful for testing out reaction wheel control algorithms on real hardware

non-critical stabilisation/pointing applications

s Forward – through open-source development:

optimisation of mechanical + electrical design

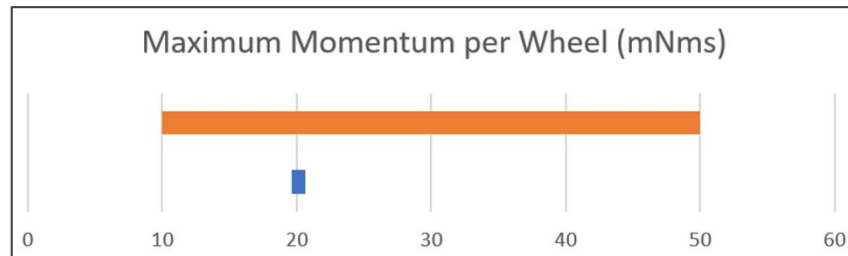
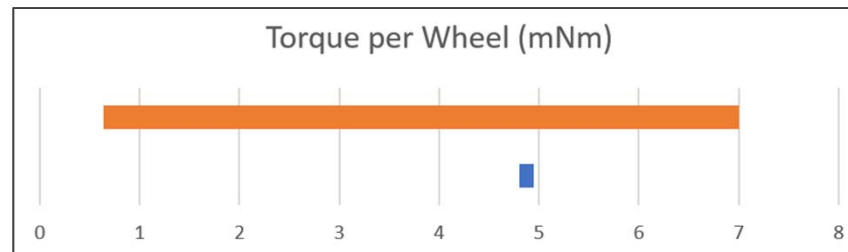
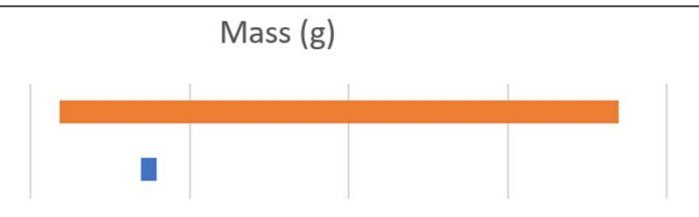
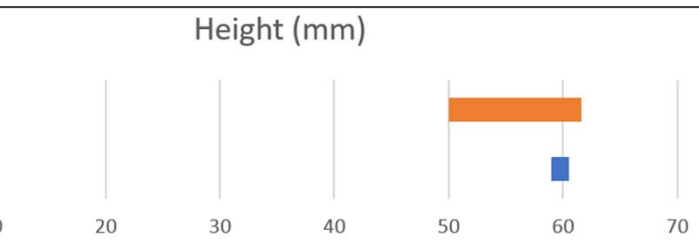
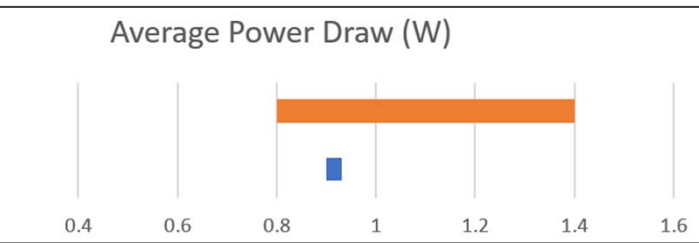
software development for use in space (i.e. three-axis rotation)

design verification + testing (mechanical FEA, functional testing, testing in space)

**End Goal: A viable alternative to commercial reaction wheel systems!**



# Additional Performance Testing



Commercial (Orange) vs. Prototype (Blue) Performance  
(Higher values are better)