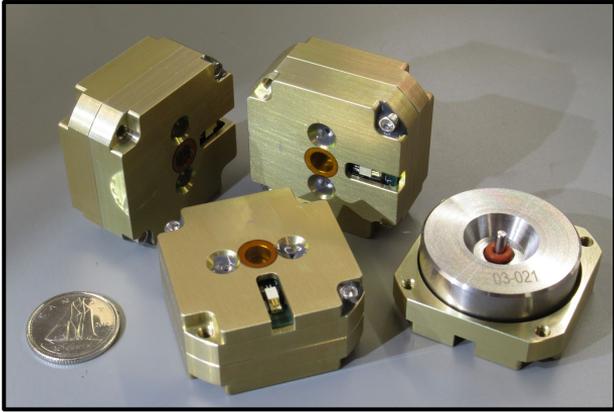


# Pico Fluid Dynamic Actuators in CubeSats

Fluid Axes

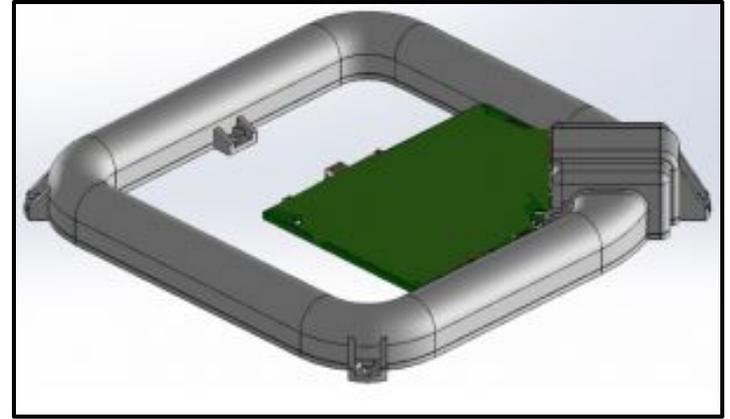
Diego Garcia Cacho

What are pFDAs?



[2]

VS



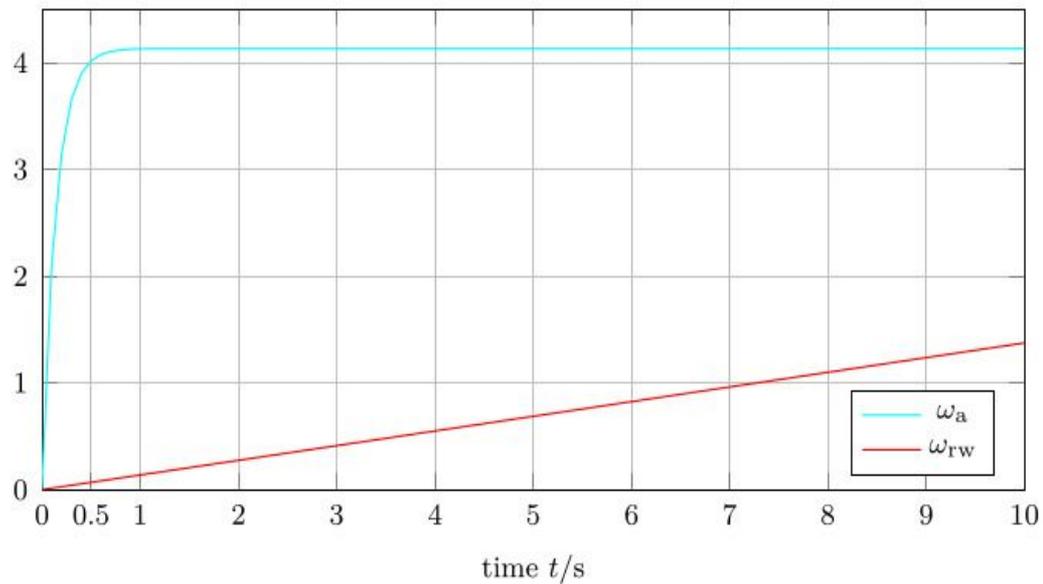
[4]

- An electric motor rotates a flywheel, generating angular momentum

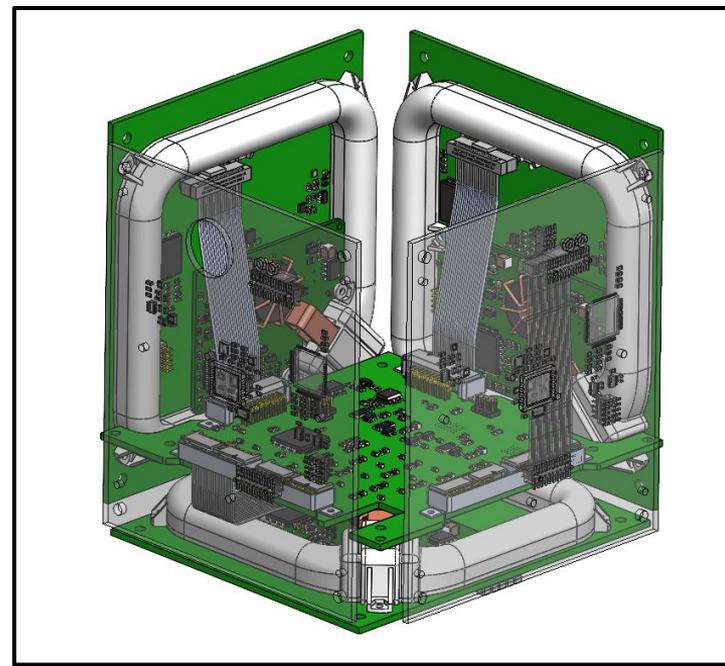
- Closed channel that is filled with a liquid metal.
- Electromagnetic pump accelerates the fluid within the channel, generating angular momentum.

**Basic Principle**

Ok, so what is the  
difference?



[3] Angular rate comparison of RW-1 type B and pFDA on BEESAT-9.

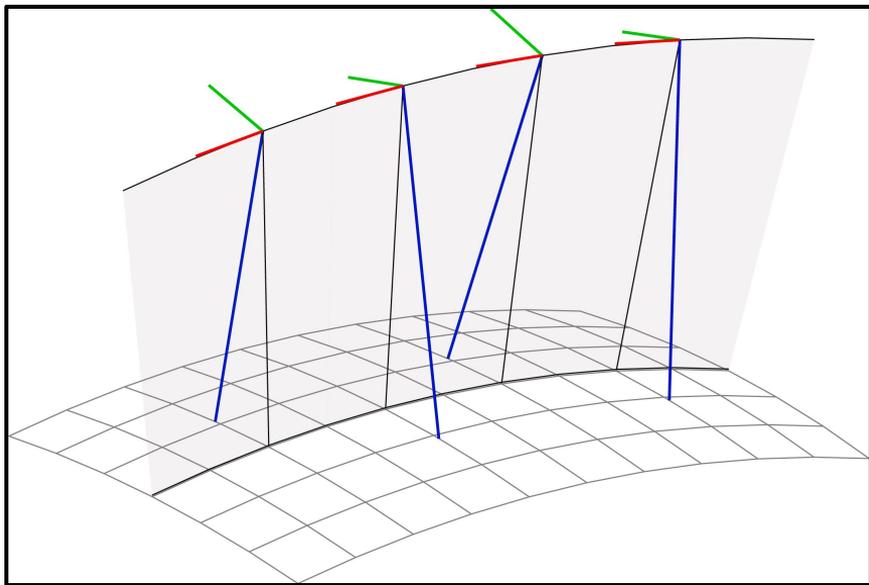


3 axis pFDA configuration

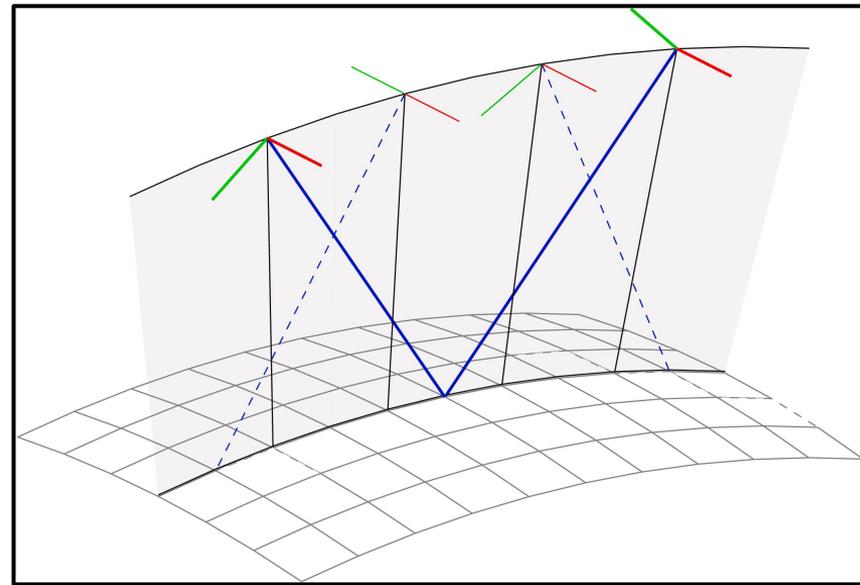
[1]

# Pico Fluid Dynamic Actuators - pFDAs

What can you do with  
pFDAs in a 1U CubeSat?



[3] Orientation of spacecraft body-fixed axes at times of image acquisition in artificial swath increase mode.



[3] Orientation of spacecraft body-fixed axes at times of image acquisition in single spacecraft stereo imaging mode.

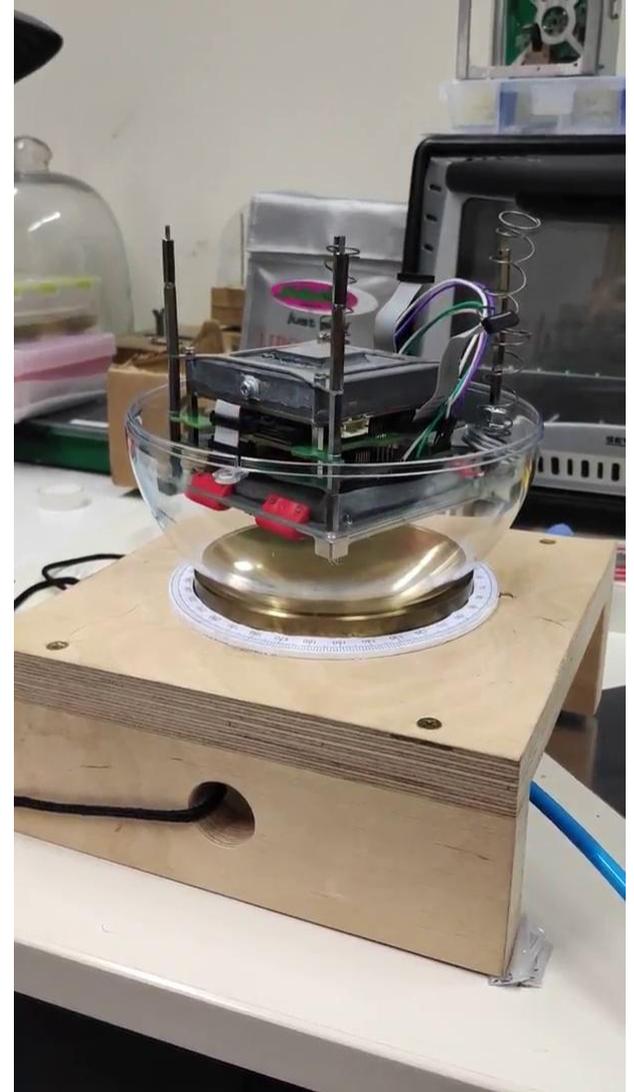
## Artificial Swath Increase (ASI) & Single Spacecraft Stereo Imaging (SSSI)

Thank you for your lightning attention

-We would love to find ways to collaborate with other projects -

[contact@fluidaxes.com](mailto:contact@fluidaxes.com)

S. Grau, D. Nolac, J. Diez, S.Ospina, D.Garcia Cacho



## References

- [1] TUPEX7 Development. Technische Universität Berlin Picosatellite EXperiment 7. Images taken by Diego Garcia Cacho. 2020.
- [2] Sinclair Interplanetary. 3 mNms Picosatellite Wheel. <http://www.sinclairinterplanetary.com/reactionwheels>.
- [3] Control of an over-actuated spacecraft using a combination of a fluid actuator and reaction wheels. Sebastian Grau Sascha Kapitola Sascha Weiss Daniel Noack, Technische Universität Berlin, Department of Aeronautics and Astronautics, Chair of Space Technology, Marchstraße 12–14, 10587 Berlin, Germany. Acta Astronautica, Volume 178, January 2021, Pages 870–880.
- [4] What is a pico-Fluid Dynamic Actuator (pFDA)? Technische Universität Berlin Picosatellite EXperiment 7. Nicholas Smith. [https://blogs.tu-berlin.de/space\\_tupex7/2019/10/20/pico-fluid-dynamic-actuator-pfda/](https://blogs.tu-berlin.de/space_tupex7/2019/10/20/pico-fluid-dynamic-actuator-pfda/) Published 20th October 2019. Date Accessed December 2020.