Jet Propulsion Laboratory
California Institute of Technology

**Hybrid Propulsion for CubeSats**

Tuesday 7th June 2016

Dr. Elizabeth Jens (353L)

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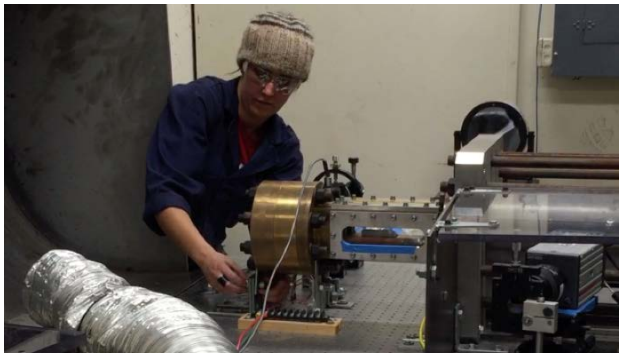
# Academic Background

2004 - 2008

- B.Sc. Engineering (Mechanical)- Hons. H1
- B.Sc. Physics



2010 - 2012

- M.Sc. Engineering (Aeronautics and Astronautics)

2012 - 2016

- Ph.D. Engineering (Aeronautics and Astronautics)

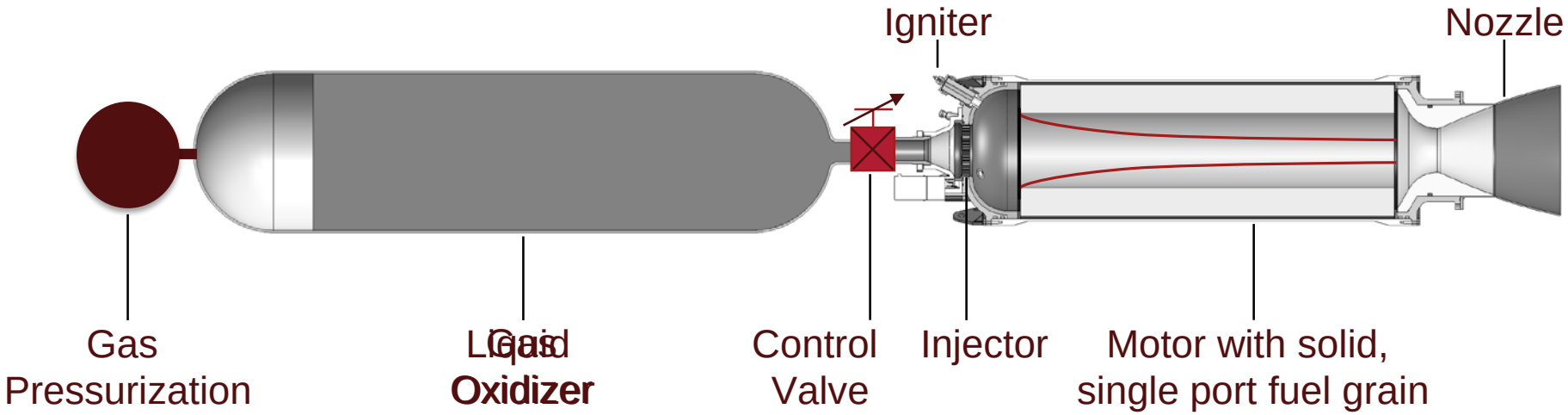
2011, 2012, 2013

- Propulsion Internship (353A)

2016 – Current

- Propulsion Engineer (353L)

# A hybrid rocket is a chemical propulsion system that typically has a solid fuel grain and a liquid oxidizer



# Test Set-Up

- Fuels: Paraffin, PMMA, expanding to HDPE and potentially others
  - 4-12” fuel grains
  - Can cast or machine grains at JPL facility
- Oxidizer: Oxygen

Multiple sizes of combustion chamber tubes

$N_2$ $O_2$ Regulator Feed System Venturi/DP

# Initial Testing with Paraffin

# Initial Testing with PMMA

# Plans Going Forward

- Moving towards full duration burns on the order of minutes (pushing current state of the art)
- Currently in the process of designing a flight-like motor to commence testing at the end of this year
- If successful this work has the potential to enable a new class of interplanetary missions
  - Able to provide a 12U CubeSat approx. 1000 m/s $\Delta V$