

- **Physics of the Jet Engine I:** Students develop model of jet engine propulsion and derive equations to determine thrust of a jet engine. Model is applied to real-world engines.
- **Physics of the Jet Engine II:** Students used their model of a jet engine to determine the energetics and propulsive efficiency of operation.
- **Centripetal Motion of Turbine/Compressor Blades:** Students apply their model of centripetal motion to determine the force on and acceleration of rotating blades and theory of rotor balance.

Lessons in Development- Physics

- **Rotational Dynamics of a Blade/Disk Assembly:** Students determine moment of inertia, torque, power and energy to spin up a rotating blade/disk assembly from rest to a specified RPM in a given time period.
- **Balancing Theory:** Students study forces on an asymmetric rotating blade/disk assembly and determine how to minimize vibration by one- and two- plane balancing. Mini-balancing machine project from lab equipment.

Lessons to be Developed— AP Physics

- Thermal expansion / contraction
- Thermodynamics of gas compression / expansion
- Forces/energetics of a hoist and/or block-and-tackle, lifting a long non-uniform object with two points of support
- Physics of fasteners (bolts) using inclined plane model – torque vs. fastening force
- Rotor imbalance due to runout
- Finding center of mass of a long object by force needed to support at each end
- Rocket Propulsion Theory – forces, energetics, efficiency

Other Lesson Ideas

- Developing hands-on Science and Engineering Activities for touring students
- Manufacturing Exercise (From NC State Engineering): Students build as many snap-brick (Lego) airplanes (or jet engines) in a time period (supply, construction, QA/QC, packaging, shipping tasks)
- Students build a model jet engine from fans and cardboard
- Fan balancing activity

GE Aviation Plant Tours

- Dave Eatman (mentor)
- Jamie Stewart (mentor)
- Chris and Craig (plant tour discussions)
- Mark (CFM56 turbine assembly)
- Florin (GE90 HPT balance)
- John and Rob (GE90 LPT assembly)
- Mike and Allen (CF6 compressor assembly and balance)
- Festos and Sean (GE90 LPT balance)
- Mike Tucker (discussions on student tour activities)
- Steve, Derek, Omar, et al. (general discussions)

GE Aviation Acknowledgements



NORTH CAROLINA
space grant

NASA Flight Fellowship Program

Flight Fellows and Mentors
(Cohort 1):

NC Space Grant K-12 Education Spotlight:
Flight Fellowships in Aerospace Science