Project 3: Infiltrator Water Technologies – Safety Platforms

- Design and construct large safety platform(s) that will provide access to two 4,400 ton plastic injection molding machines

Sponsor:

Scott Ladd
859.745.3768
sladd@infiltratorwater.com

INFILTRATOR®
water technologies

Project 4: Sun Windows – Air/Wind/Water Test Wall

- This system needs to be designed to test window and door units according to the ASTM E283, E331, E547, E330 and AAMA / WDMA / CSA 101 / I.S.2 / A440 specifications.
- The existing test wall is not functioning and needs to be designed to handle approximately 100 psf structural tests as well as air and cyclic water tests.
- The tests would be controlled from the computer solely and all readings would be taken from the computer also.

- Sponsor:
  - Scott Merkel
  - 270.684.0691
  - smerkel@sunwindows.com

Sun WINDOWS & DOORS

Project 5: Toyota Body Weld – Surface Inspection Door Panel Auto-Oiler

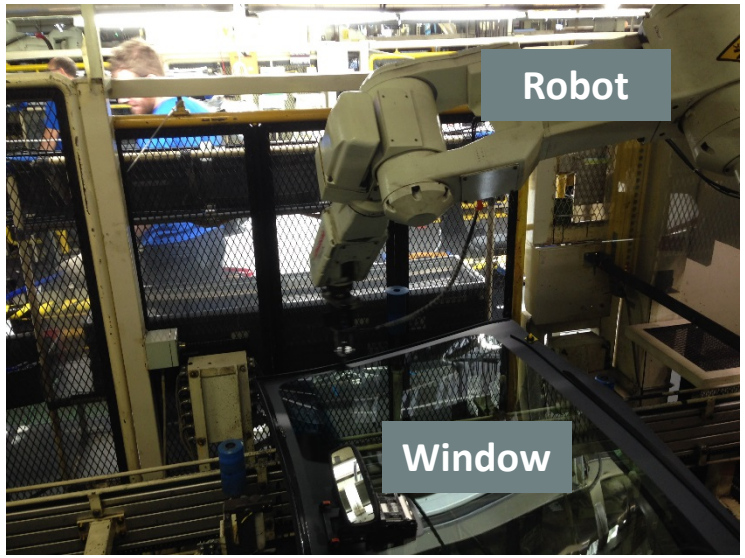
- Apply “oil” lightly and evenly across the door skin as the car bodies are moving down final line.
- System would be installed immediately prior to the surface inspection light booth to greatly improve TM capability to visually detect surface defects.
- Application becomes an ergonomic burden and absorbs up to 15 seconds of the cycle time.
- Currently have rough prototype as a launching pad, but it needs better fluid flow regulation and a more adept and agile application. Also, it will need to involve design aspects with safety in mind, such as hinged movement with the body flow and pinch point mitigation etc.

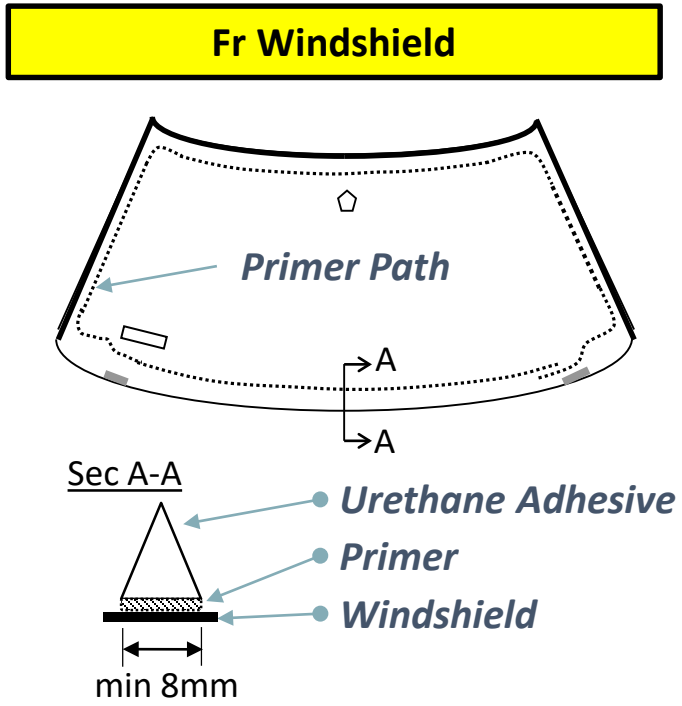
Sponsor:

- Spencer Smith
- 859.570.6402
- spencer.smith@toyota.com

Project 6: Toyota – Window Primer Skip Detection

- Background: During Window preparation, Primer is applied to window prior to urethane adhesive application. This is all performed by a robot in a machine workcell. Primer skip and/or voids are currently undetectable and quickly covered by urethane. The absence of properly applied primer could result in a vehicle waterleak.



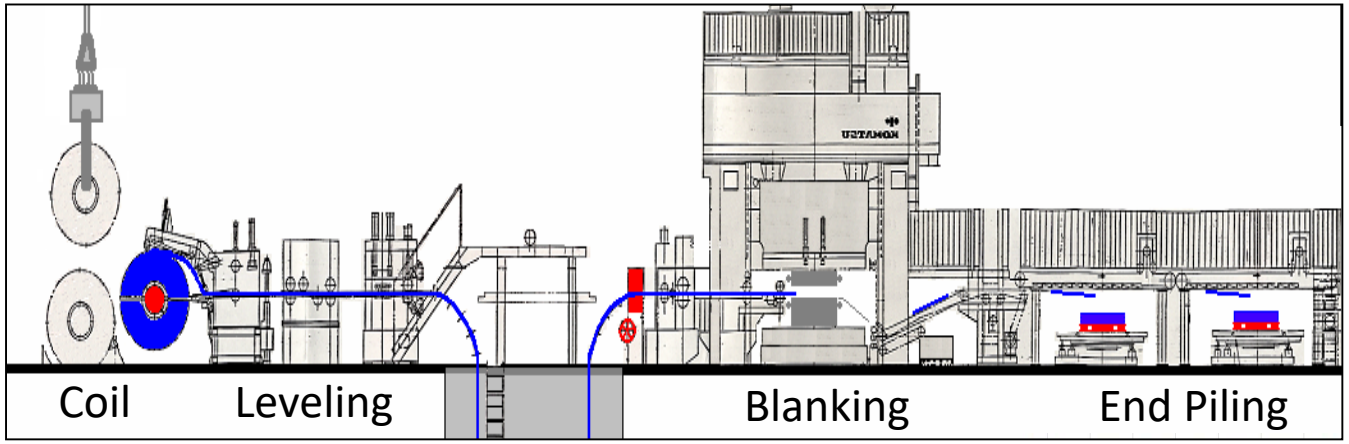


Must have primer coverage between Urethane and Windshield

Objective: Develop a method to detect any skip or void in the primer application path prior to urethane application without adding machine cycle time.

Project 7: Toyota – Stamping Blank Side Piler

Traditional Blanking Line

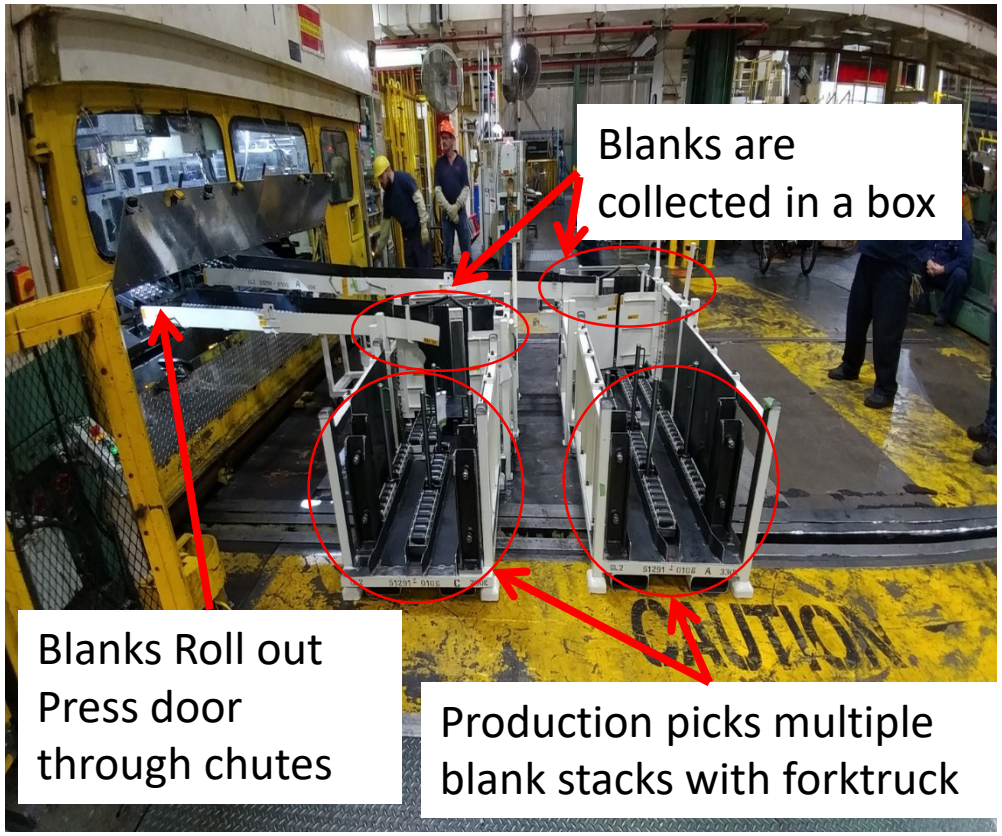


Background: Blanking is a process used in Stamping to create blanks of raw material in the correct shape to be pressed into formed parts.

Some blanking dies make multiple blanks at once, sending one blank to the traditional end piler and 1-2 blanks out the press door on the side. The blanks that come out the side are collected into a box known as a "side piler." Typically these blanks are difficult to stack as they do not exit the die consistently and are not well controlled. The newest model change at Toyota has seen a large increase in the number of side pilers used, which has created a challenge for Production in both storage and set up of many side pilers.

Project 7: Toyota – Stamping Blank Side Piler

Current Piler



Objective: The goal of this project would be to develop a concept and prototype of a side piler that could process 10 current parts and be adaptable for future parts. Stamping would like this to be a mechanical and pneumatic design that should be:

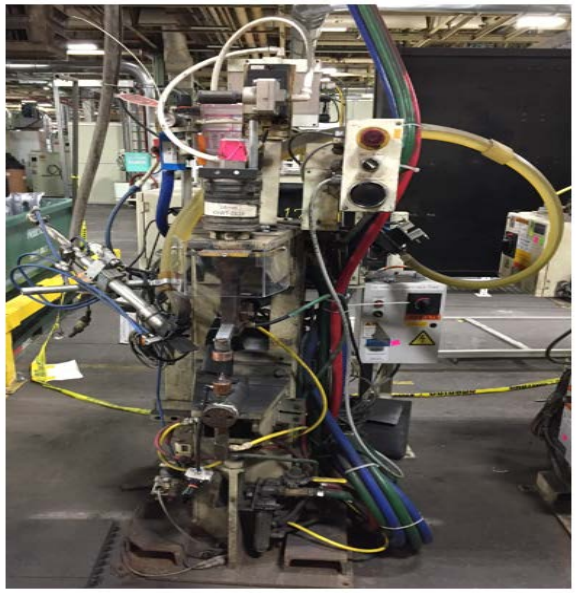
- -Capable of stacking blanks consistently
- -Capable of handling blanks with large amount of variation in size and shape
- -Adjustable with little interaction from Production
- -Capable of stacking blanks with <2mm variation
- -Easy to set and remove with consistent locating
- -Capable of being used on 2 different blanking lines
- -Compact to be able to be easily stored

Contact info: Primary- Anthony Estep anthony.estep@toyota.com
Secondary- Sam Smiley samual.smiley@toyota.com

Project 8: Toyota – Nut Welder Safety

Background: We use stationary welders at TMMK to apply welded nuts to some parts.

Standard Nut Welder



TM holds the part while a nut is automatically fed from to the weld tip. The TM then presses a button to activate the welder. We have eliminated foot pedals to prevent accidental welding and the associated pinch point for hands. The TM now holds the part with one hand and presses the button with the other. This reduces the likelihood of a pinch, but if their hand is in the wrong spot it is still possible. We have also installed sensors to not allow high pressure pinching until current is seen, this also prevents a major clamping pinch, but there is still some risk of injury at the low pressure level or when the part feeder installs the nut to the head.

Project 8: Toyota – Nut Welder Safety

Objective: provide protection to prevent activation of the feed unit or welding pressure while any object thicker than sheet metal is present (no fingers or hands).

Contact info: Primary- David Cox david.cox@toyota.com
Secondary- Larry Bromling larry.bromling@toyota.com

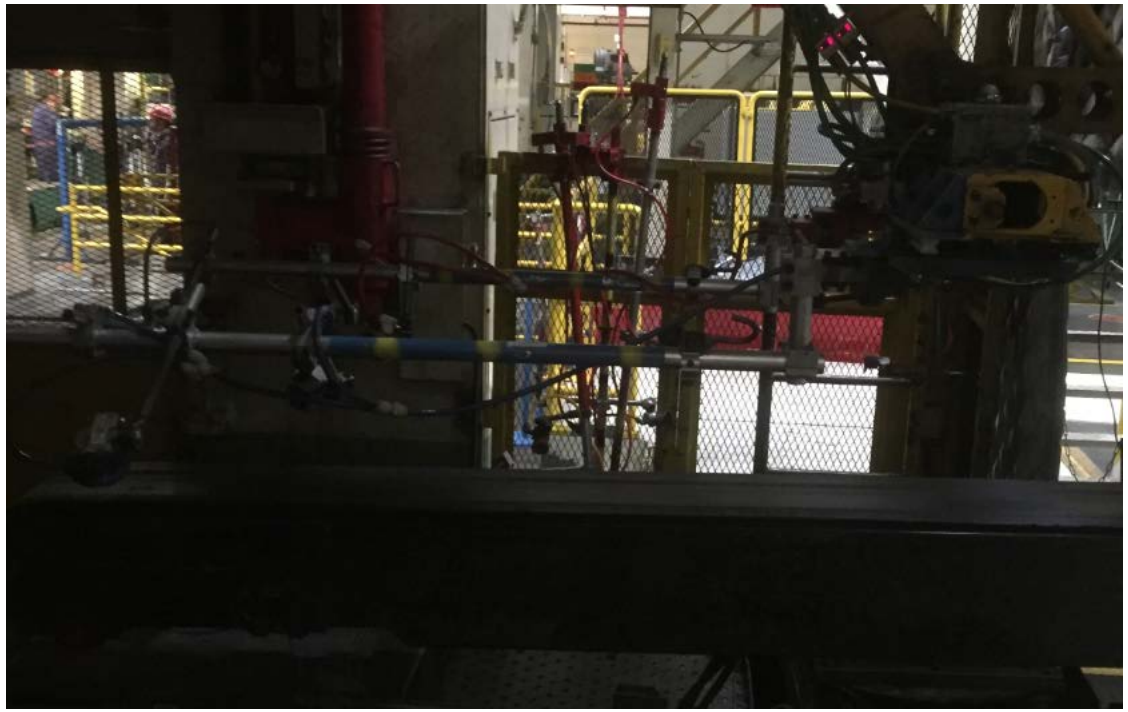
Project 9: Toyota – HDA Weight Improvement

Background: Stamping presses use HDAs (Handling Device Attachments) that are custom for each part we make. They are manually changed with each die change and must be lifted to be attached to the robot or transfer system.

Rack holding HDAs

HDAs are currently made of aluminum and steel, and can be very heavy. (The North American standard is currently 38 pounds.) These are fabricated in pieces, like “tinker toys” with connections and joints required for the complex angles. Typically they also hold vacuum cups as the part touch device, so hosing for the vacuum supply is external. Once these are designed and tuned, there is no need for them to be adjustable.

Project 9: Toyota – HDA Weight Improvement



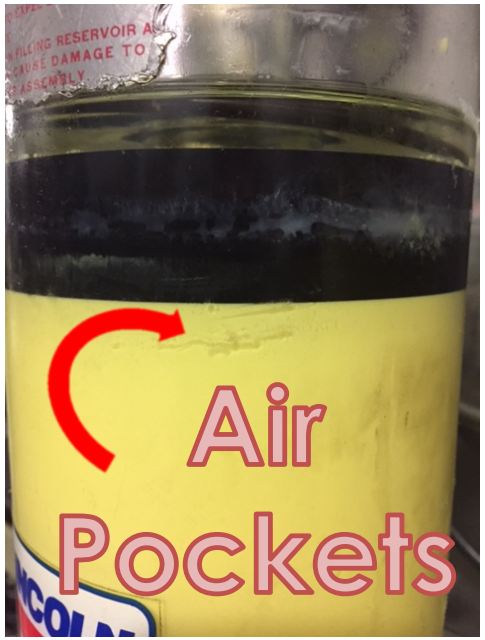
Objective: develop an HDA design that is lightweight, fixed dimensionally (not adjustable), and provides vacuum lines through the tool (No additional hoses)

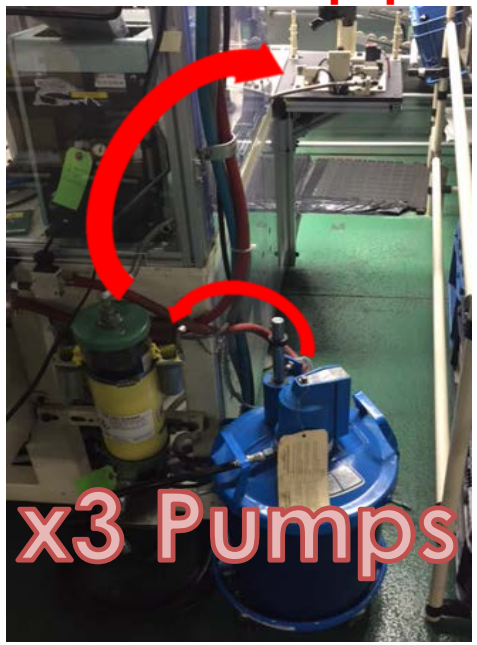
Contact info: Primary- David Cox david.cox@toyota.com
Secondary- David Frost david.frost@toyota.com

Project 10: Murakami – Grease Pump

In conjunction with an Electrical Engineering Team from UK, Murakami is looking for a new method to apply grease to the products we manufacture. We require a new method that prevents/removes the following:

- **Air Entering the Line**
- **Grease Separation**
- **Redundant Equipment**





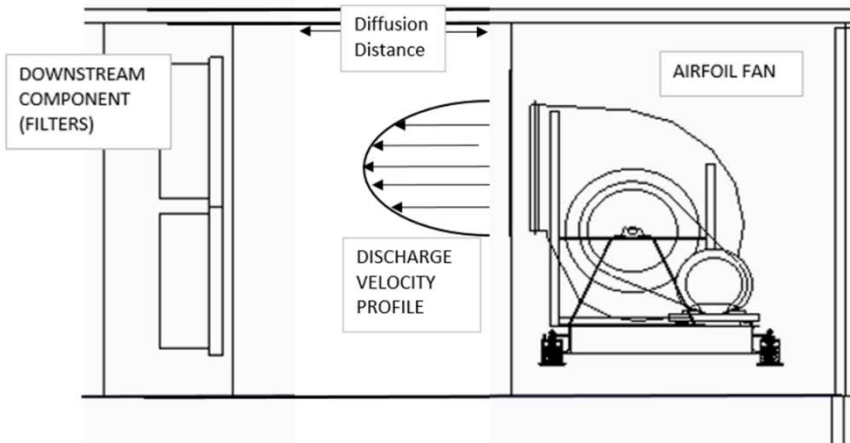
Other grease pump systems use vacuum degassing or agitators to remove air or remix the grease respectively, and some can be mounted directly to our grease pales, but we need a system capable of all three.

Sponsor: Chris Force
270.469.3939 cforce@murakami-usa.com

Murakami

Project 11: Trane – Optimize Diffusion of AHU Fan

- In air handling units (AHU) fast moving air discharging from fans must be diffused to ensure proper air flow through downstream components. Customers pay for the diffusion via the cost of AHU length and building floor space. The project reduces AHU costs by optimizing the distance between the discharge of DWDI airfoil fans and downstream components.
- Problem to Solve: Reduce Air Handler cost by optimizing the unit diffusion length between the discharge of DWDI airfoil fans and downstream components to ensure proper airflow through downstream components
- Reduce diffusion length by 20%.
- Review, understand, and baseline diffusion length in current AHU offering.
- Research existing technology, including industry patents, for air diffusion in AHU plenums.
- Provide supporting schedule and resources to achieve the goal.
- Develop design hypothesis.



Sponsor:

- Joe Stewart
- 859.288.2751
- jostewart@trane.com

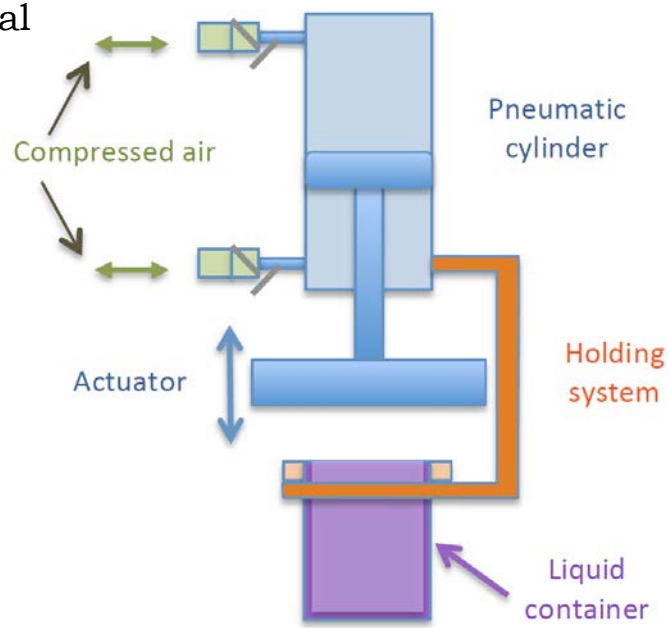
Project 12: UKME – Explosive Vaporization

Explosive vaporization, which is essentially very fast boiling is not yet well understood but is extremely important in space where ambient pressure is very low, for instance in the liquid fuel storage systems of engines

- Design and build an experimental set-up to achieve those far-from-equilibrium conditions.
- Visualize explosive vaporization with a high-speed camera.

To facilitate the visualization, the liquid will be confined in a tube of glass. In order to keep pressures manageable, (not higher than 10 bar) we will use the refrigerant R-134A as fluid, which has a saturation pressure around 6-10 bar at ambient temperature. The figure shows a conceptual sketch of such a set-up, which involves the design and fabrication of

- **holding system** of the liquid container and the opening system attached together.
- **opening pneumatic system,** driven by compressed air, to confine the liquid at pressure.
- **control system,** based on electromagnetic valves, to release the pressure at precisely controlled opening speeds.



- Currently two team members

Sponsor:

- José Graña-Otero
- 859.218.0645
- jose.grana@uky.edu

Project 13: UK Solar Car – Design and Construction of Tire Mounting Fixture

The solar car team must routinely dismount, mount, and balance specialty tires on specialty wheels during the race. For a large portion of the race, team members will be confided to a minivan following the solar car on the road. Logistics of replacing blown or worn tires would be greatly simplified if tire changes are possible without stopping and exiting the vehicle.

- Cost less than $300
- Be usable while seated in a typical minivan, or on an open floor
- Be as compact and lightweight as possible
- Be capable of dismounting and mounting a solar car tire on an appropriate wheel in 2 minutes without great physical effort or damage to the wheel or tire
- Be capable of statically balancing the wheel/tire assembly (in plane)

Sponsors:

- Chris Heintz, Austin Jordison, and Connor Varney c.heintz.357@gmail.com

Project 14: ASME – Human Powered Vehicle Challenge

- Refine existing frame design (currently in RGAN 312)
- Create aero system
- Compete against other schools
  - Speed
  - Endurance
  - Design
  - Innovation

- https://community.asme.org/hpvc/default.aspx

Sponsor:

- Dr. Herrin
- david.herrin@uky.edu

Project 15: UKME – Automated Tool Locker

- Design and build automated and modular tool locker
- Create software interface for swipe card or RFID reader and automate locks
- Must be secure, reliable, and easy to use
- Must store swipecard access log

Sponsor:

- Andy Kerr
- andy.kerr@uky.edu

Project 16: NASA Robotic Mining Competition (Joint project with EE)

- Teams of students from throughout the nation will demonstrate their excavator robots May 22-26, 2017
- Design and build a mining robot that can traverse the challenging simulated Martian terrain. The mining robot must then excavate the basaltic regolith simulant (called Black Point-1 or BP-1) and/or the ice simulant (gravel) and return the excavated mass for deposit into the collector bin to simulate an off-world, in-situ resource mining mission.
- Work with EE Senior Design Team(s) on project
- http://www.nasa.gov/offices/education/centers/kennedy/technology/nasarmc.html
- Contact: Dr. Regina Hannemann (EE Dept) R.Hannemann@ieee.org