**Agenda**

* Introductions
  + check!
* Bring Cal up to speed
  + Check
  + What are Gerry’s requirements
    - 1st draft of project contract on 1/24
    - Operating contract 1st draft due 1/31
  + Cal recommendation:
    - Let him revise contract prior to submission
* Brief individual reports on winter break progress
  + Discuss things with James because he thinks stuff.
* Discuss initial design and prototype
  + Review Proposed Timeline
  + Create and assign action items
    - Have a slower discussion and create the gantt chart (on the second hour of the meeting
    - Coach: check out the OSGC proposal

#### 

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Deliverable** | **Objectives** | **notes** |
| TBD | Preliminary Pump Sizing Requirements (Design Outputs) | Determine number of stages, pump rotational speed, pump impeller tip speeds, impeller entrance and exit diameters, pump efficiency, shaft power required to drive pump. | Complex, needs a team effort to dial in further. This will evolve along the term as well. |
| Jan 23, 2017 | Initial COTS components selection | Individual team members finalize and present 5-10 candidate OTS tech (Bearings, Motor, inverter,). | Finalize as a team effort |
| Jan 29, 2017 | Feasibility Study of COTS Parts |  |  |
| Feb 1, 2017 | Non-Functional prototype | Determine feasibility of form, flow loop, bench size and orientation. | demo |
| Feb 7th, 2017 | Submit Purchasing Request For finalized COTS |  |  |
| April 2, 2017 | Subsystem testing | Assembly and validation of subsystems and COTS components |  |
| April 23, 2017 | Functional prototype | Assembly of subsystems |  |
| April 25, 2017 | Initial testing | Static checks, dynamic checks (cold test), validation runs. |  |
| May 7, 2017 | Post processing, alternative comparisons | Validation for final prototype go-ahead |  |
| May 21, 2017 | Final prototype |  |  |
| May 28, 2017 | Final Prototype cold testing | Final Prototype cold testing |  |

## 

**Agenda:**

* Project proposal due 11/18
* Discuss methodology section of project proposal
* Assign jobs
* NASA OSSI app opens 11/10: <https://intern.nasa.gov/ossi/web/public/main/>

**Discussion:**

* Working on methodology section of proposal document
* John is working on POS

**Action Items:**

* Finish your group credentials
* You should all become HAM certified there are flash cards in the rocket room

**Agenda:**

* Discuss first draft of Project proposal (see below)
  + Assign tasks
  + Comparison between blowdown and elec. pump for proposal
    - Able to clearly state the benefits of EFS
* Editable Project proposal for ME-491
  + <https://docs.google.com/document/d/1uvotuCvJKjI4pJqUpyjYXXvga9fgtQH5B9vrdNpAy48/edit>
  + Start adding to this as you have ideas.
* The slack...use it!
* The Trello...use this too! (I will link the two once everyone is on board)
* Push your work to Github!! Please.
* Changes good/bad made to pump sizing calculator
* Talk to Kristen about possible LFE meeting
* Talk to Kyle about possible LFETS meeting

**Discussion:**

* Found typo in pump sizing iPynb
  + This is great for efficiency numbers
  + Not so good for RPM
* Rough draft of project proposal due 11/18
  + We will hash out the methodology section together at next week’s meeting
* Questions for Kyle/Asa:
  + We will talk to them tuesday and see if it is really worth a full meeting
* Questions for Kristen:

**Action Items:**

* Individually fill out your group credentials in the project proposal document
* iPy notebooks
  + Read through these
  + If you have suggestions of things that need to be added to them just start adding things.
* Come to meetings next week’s meeting.

**Agenda:**

* Discuss first draft of Project proposal (see below)
  + Comparison between blowdown and elec. pump for proposal
    - Able to clearly state the benefits of EFS
* AIAA call for student papers
  + <https://region6.aiaastudentconference.org/>
* Editable Project proposal for ME-491
  + <https://docs.google.com/document/d/1uvotuCvJKjI4pJqUpyjYXXvga9fgtQH5B9vrdNpAy48/edit>
  + Start adding to this as you have ideas.
* The slack...use it!
* The Trello...use this too! (I will link the two once everyone is on board)
* Push your work to Github!! please.

**Questions for Erin:**

* Are we designing for the existing LFE or the theoretical LV4 LFE?
  + Design for the existing engine
* Comparing blowdown system to EFS system.
* Erins desired deliverables
  + Constructed from COTS components
  + build /test a working prototype (on the ground)
  + SOP
  + Design docs
    - Design methodology and process
    - Most capstones do not document well...we can do better.
  + 0.03 ft^3/s flowrate of IPA
  + Do not build “greek fire” if we just do analysis someone else needs to do analysis over again to make a rev 2.
  + Do something similar to the LFE team. Parametric design tool.
    - We are only open source if someone copies us!!!
  + Erin’s hopes & dreams: Compare concepts to blowdown system. Design/build prototype. Cold flow test w/ water. Cold flow test w/ liq. N2. HOT FIRE!!!((secret hidden level))
  + Our requirements interact with the other team’s (tanks)
    - Current record for student team: 25km
    - The reason for this is because rockets are heavy!
      * The rocket equation.
      * Linear increases in delta v required give exponential increases in rocket mass!
      * Delta v to orbit is 9km/s with 18km/s you can get to saturn!
        + “LEO is halfway to anywhere”
      * Mass drives every decision in aerospace
      * The traditional material for tanks is alum.
        + There are maybe 100 people in the US that can weld alum. To AIAA tolerances.
        + SDSU is making welded tanks but they are jerks with help.
      * CF tanks are REALLY strong!
        + Tanks factor is absurdly high
        + Easy with ethanol...not so much with LOX
      * We want high pressure in the tanks because it makes our job easier...they want low pressure because LOX sucks...hard
      * If both capstones succeed we literally win at everything!!!
        + 100km rocket <200kg
        + Smallest 100km rocket: ~3000kg
      * Google “generative design” if you’re interested.
      * We don’t know what tank pressure we are going to get
        + We will need to tell them what we need at a minimum and tell them to do the best that they can
        + Our job is to make their job easier.
* Existing engines chamber pressure: 375 psi
* The point of a capstone is to start fresh.
* Erin wants to push requirements on us so that they have some small chance of success
* BU claims to be working on EFS...We shall crush them!!!
  + Rocketlabs will probably be the first pro group to fly an EFS system to space.
  + Maybe we should try to ask them things.
* Don’t care how heavy the motor is? (not a flight system)
  + We don’t need to optimize for weight at this time but if there are design decisions that may have later implications for weight we need to carefully consider them.
* Something similar to what we should build:
  + …
* BE GOOD AT DOCUMENTATION!!!
* Pressure requirement is unconstrained except by what the other team can manage

**Discussion:**

**Decisions that need to be made:**

* How long does the shaft need to be?
* Controls for safety features
* Are we running a pump that is too small for bearing heater.
* We may or may not need an inducer
* Erin will add some more papers to efs repo
* Pump sizing is for a 4.5 kN engine...lets check what it looks like for ours.,..

How do we feel about the two teams to be linked in this way?

Arbitrarily the outlet pressure is ~500 psi

* How high to we actually need the chamber pressure to be?
* We need chamber pressure + line losses
* What happens if chamber pressure is unexpectedly high?
  + We can plan for combustion instability
  + Don’t worry too much...we will talk to Kristen about possible failure modes of the engine.
  + Otherwise we blow up a few in testing...probably both.

Recap

* 1st draft: hone in on requirements reference literature
  + Consider parallel projects in proposal
  + Put a “LIT hub” section in the proposal
    - Start pulling literature together anyway
* MEs suck at Github please do better.
  + Don’t hoard your work...share with the class please
  + We need to walk future groups through the process (ELI5 style)
* Ipynb is super useful and we should use it!
  + Erin is super willing to help
* We can write papers from this
  + But we need to make it easy to follow

**Action Items:**

* Proposal due as the final
  + First draft due: 11/18