**3/9/17**

**Progress**

On 3/5 we did some test layups with the virgin side of PTFE to assess the melt bond’s ability to adhere.

One PTFE on aluminium

One PTFE on carbon fiber

One PTFE on nomex

Additional test measurements on the shrink tape

**Updates**

*(short statement of results we can talk about process after the meeting if anyone has questions)*

Additional test measurements on the shrink tape (needs to be re-done, failure during heating process)

All adhesive failed on virgin side as expected

Erin want’s us to to 3 inch

He wants us to go simple with caps

We will have to explain to Gerry that are design considerations are being shortened.

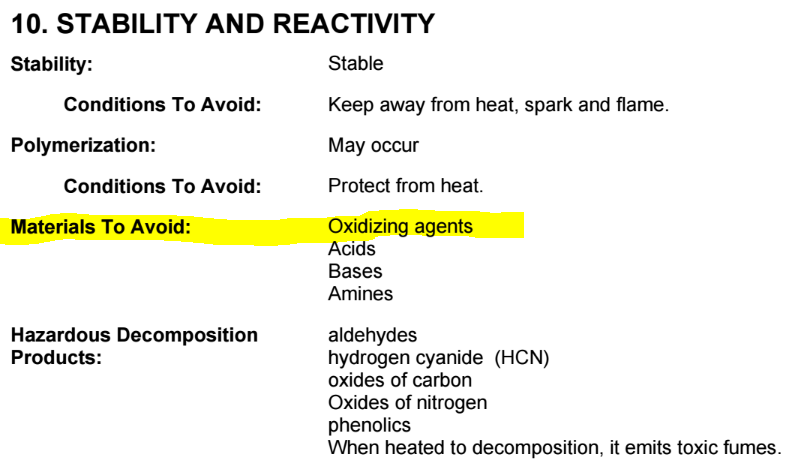
**Weldon**

**Francesca**

**Neil**

Concerns with METLBOND 1515 & LOX

From Metlbond Data Sheet…



Would like to run simple test with coupons + metlbond asap, (ex submerging in small amount of LOX) to test degradation/speed of potential failure...may not have immediate effect and will work out OK

**Russell**

**Chris**

**Alex**

Got budget done. Let’s start spending money.

No overhead taken out of the award

Check the units on the ipython notebook optimization

[www.Watzlavick.com/robert/rocket/rocket1](http://www.watzlavick.com/robert/rocket/rocket1)

**Whats Next?**

(Time to make decisions on what we need to do next week)

**3/2/17**

**Progress**

On 2/26 we did some test layups with the chemical etched PTFE to assess the melt bond’s ability to adhere.

One PTFE on aluminium

One PTFE on carbon fiber

One PTFE on nomex

We also did some preliminary test measurements on the shrink tape

**Updates**

(short statement of results we can talk about process after the meeting if anyone has questions)

Weldon

I’ve been sick most of the week, and haven’t made much progress. I should have the notes from the safety training up in the next couple hours. I’m also putting the finishing touches on the documentation procedures. I’ve been gathering safety documentation as well. I’m also trying to gather documentation on standard LOX tanks and filling procedures.

Francesca

Neil

Russell

Chris

Alex

**Whats Next?**

(Time to make decisions on what we need to do next week)

**2/23/17**

**Progress**

**What we said we would do**

Alex- Weight reduction on cad models, follow up on contacts for quotes on donations

Russell- More research on PTFE, Spend some time looking at strength and permeability.

What is the pressure from shrink tape?

Baseline thickness of PTFE liner

Weldon- going to chem safety training contact gas suppliers, put together a documentation standard

Neil- FEA heat transfer analysis

Francesca- FEA play around with different materials , abstract for AIAA, meeting tuesday about python.

Chris - Get quotes for PTFE liner, What kind of surface treatment do we use, Continue to move things to github and make issues.

**Alex**

**What did you do?**

Looked at aluminum suppliers and possible endcap manufacturing options.

**What do you need?**

Get together and talk about design

**Whats next?**

Send budget to jun

**Chris**

**What did you do?**

We have samples!

Requested quotes from APT and these guys.

<http://catalog.fluoropolymerproducts.com/viewitems/all-categories-molded-teflon-cylinders/ries-molded-teflon-cylinders-molded-ptfe-cylinders?&bc=100%7C3001036&os=y>

<http://www.enflo.com/products/molded-ptfe-cylinders/>

<http://technetics.com/products/ptfe-polymer-solutions/ptfe-shapes/rod-and-cylinders/>

**What do you need?**

**Whats next?**

**Call enflo about Molded PTFE Cylinders (1-713-983-4201)**

**Neil**

**What did you do?**

[**https://drive.google.com/open?id=0B26o6W76DxOec291OEVBQlhRY0k**](https://drive.google.com/open?id=0B26o6W76DxOec291OEVBQlhRY0k)

Made SS thermal stress FEA

Deflection as a result of cryo cooling

Found out how to move solid models to abacus

Worked on AIAA abstract

**What do you need?**

Solid models

**Whats next?**

Vibrations?

**Fancesca**

**What did you do?**

Working on AIAA

**What do you need?**

**Whats next?**

**Russell**

**What did you do?**

Sizing for the thickness of liner

Back of envelope calculations based on a 1mm material thickness.

6\*7\*.04 cylinder is about .41 lbs

Permeability 5.86cm^2 O2 lost per hour (possibly not an issue)

Yield strength of PTFE about 182 psi at 175 c (from linear interpolation)

Max pressure on cylinder is about 2.4 psi (we won’t be able to layup on this)

Insulation properties (not great at the thickness we are looking at)

<https://drive.google.com/open?id=0B80-Nm0s3cT6VXhIdFNLOGdUNmM>

Take away

PTFE will only be useful as a LOX barrier. Go as thin as possible!

**What do you need?**

**Whats next?**

**Weldon**

**What did you do?**

I went to the chemical safety training. Some good information there about safety and emergency services. I’m working on writing up a sheet of notes for easy reference.

Started work on a documentation procedure document. Not quite finished yet.

Have been researching LOX suppliers, storage containers, and filling procedures. I’ll put together a sheet about this as well (likely I’ll get this done just after I get the documentation procedure finished up).

**What do you need?**

**What’s next?**

Finish creating the documentation procedure, and follow it while producing note sheets on the safety training and general LOX information.

Follow up on some research concerning regulations and codes associated with the use of LOX as part of the fuel mixture for LV4.

Explore concerns about how long the LOX will remain in it’s liquid state under the current design conditions.

What issues might need to be addressed if the pressure of the expanding gas exceeds the design pressure?

Would that cause any catastrophic problems in the fuel pump system?

**2/16/17**

Alex showed off some designs he modeled

Need holes and weight reduction (we still need to refine the thickness)

Now that we have a model we can get a quote for PTFE liner

Indium lining of interface

Do we want to account for insulating materials

Foam or vacuum

With such a small gap will insulation actually help

Nomex will also help insulate

Let's not worry about it

Limiting factor for aluminum is how thin we can machine it

Thin wall pressure vessel calculations

For the pressure we are going for the an aluminum tank would be very thin

Permiability of O2 through PTFE

What we are looking at is at room temperature

Document everything

Nasa want reports from us

Show them that we are doing things

They want “nuggets”

Test coupons

How are we going to create them ?

What are the specks of the test coupons for testing?

Lab in ondine does not want a bunch of students to using the lab.

Perhaps they will do the testing for us.

This would be great!

It would be great if testing was our least concern

How do we want to test them

Margaret is our contact for money.

Lets buy stuff local if we can and reduce shipping cost

Prototyping

How are we going to load the tank with pressure

Will it seal cold?

Air gas and matheson

Let's talk to them and get some info

Talk to them online

**What will we get done this next week**

Can we find someone to stamp out an aluminum endcap?

What sizes do they have available?

We can then order more than one

Alex- Weight reduction on cad models, follow up on contacts for quotes on donations

Russell- More research on PTFE, Spend some time looking at strength and permeability.

What is the pressure from shrink tape?

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Chris - Get quotes for PTFE liner, What kind of surface treatment do we use, Continue to move things to github and make issues.

**2/9/2017**

What have we done, what will we do, is there anything holding us back?

[**Action Plan**](https://drive.google.com/open?id=1IFkCph4sUu5lX_zHoPREmssZP85U279T_9PHecbIcHA)

**Contacts**

Made contact with APT Teflon working on getting samples(most likely get them) They may be able to manufacture a liner that we can then layup on top of. (potentially).

Made contact with Jerry from 3M aerospace tapes and adhesives department. Looking into scotch weld. (Haha)

**Modeling**

Has anyone modeled anything yet?

No

**Finances**

We were told by Andrew that if there are more financial concerns they should be directed towards him.

We have to pay for shipping of samples andrew is paying with cc

**Documentation**

GIThub tutorial in the rocket room 1 pm, 2/9

Let’s get some end cap drawings

**Design**

<https://drive.google.com/open?id=0B_82kiJ5gcsyR2Eya3JLbmswQUE>

-Arbitrary tank design dimensions: **4’’ inside diameter, 8-¾’’ inside long** or 6’’ diameter, 13 inch long

-**Tank working pressure around 3 atm**

-Pump team is optimizing pump to work with tank pressure between 2 - 3 atm

- Timeline to complete design phase in 6 weeks

What do we need to accomplish?

Who is going to accomplish these tasks?

-we may need a thermal buffer at the ends

-what kind of shape

With regards to thermal coefficient (show in our design that we are considering this)

How much will the hemisphere contact

**Timeline**

16 weeks to get everything done

Iteration every 2 weeks. By the third iteration hopefully we will nail down our design 2/16

When we send thing to manufacturing we will plan what we will do while we wait

**Presentation**

Problem 1: thermal expansion diff (Francesca)

Problem2 : How do we manufacture (interfacing and manufacturing)

If we can just layup everything in one piece (Neil)

Problem 3: seal (Weldon)

**Meeting With Jun**

We have leveraging for money

Too many tests can be a waste of our time

We should be confident with our design

Lets only do meaningful tests

Do we have potential vendors

Machine science( has helped PSAS)

ProtoLabs

Check Ebay or alternative sources (can we recycle things?)

Can we find a teflon tube somewhere else

**Things to do**

1. Presentation slides: Neil, Francesca, Weldon
2. Team Contract Revision: Chris, Russell, Alex
3. Test meltbond

Test every one of our interfaces individually

-machine shop to cut Al

(alex will come in tomorrow)

-Layup on Sunday: Alex, Francesca, Neil, Chris

9 Am

4) FEA Donut thermal analysis: Neil, Francesca

5) Design Options: decision made during 2/16 meeting

2/2/17

* We meet trishia
  + Requirements for OSGS
  + We need to come up with the matching funds
  + Alex has been great
  + She has concerns with the budget
    - We were awarded 8000 trisha thought we needed to raise 24,000
    - We clarified that we have a bunch of donated materials
    - Maybe get a contract from psas
    - We purchase through psas for the 2000
    - **We need to talk to andrew (get a contract for $2136)**
    - **We need to make trisha’s job easier**
      * Trisha has less worried now
    - **No spending OSGS funds yet**
    - Is someone going to take a cut out of our money?
      * Subcontract
      * Overhead
      * We may see less than 8,900
      * Probably 5%
      * We need to be very careful with spending and documentation to make the university and NASA happy
      * Boeing has was compensated last year for their donation
      * Make lasting relationships and good connections to open bridges and keep them up.
  + Team roles
    - We need to come up with a way to evaluate members
    - Let’s get rolling on this 16 weeks left
  + What should jun expect next week
    - We are doing a layup on sunday 9AM
    - **We should meet more.**
    - Do we want to make Gerry happy or PSAS
      * Making gerry happy will fall in
    - Make a plan for who will do what
    - Not everyone needs to do everything
  + Action plan
    - We have a list of tasks that we need to do lets divide the tasks by subteams.
  + Jun’s question
    - Do we want to look into professional manufactures with the money we have?
    - Then maybe we could compare what we have
    - This is not an option for our final deliverable
  + Jun’s research
    - Liquid nitrogen is colder
      * **We need a way to test for micro diffusion**
      * There are still safety concerns with LN
  + **We should reach out to companies that are already making tanks (LOX and nitrogen and also composite tanks.**

**1/26 Meeting with jun**

* Jun’s said some things
  + We are ahead of most groups
  + Has contacts we might be able to use for materials
    - They have already helped PSAS once let's convince them to do it again.
    - If you can’t supply materials can we talk to someone who was apart of the project with NASA
* Presentation
  + Jun’s comments
    - How do we measure the pressure
      * Russell has a plan using his own equipment
    - Test one at a time and improve from that until the fabrication is perfected
      * Alex “we can practice layup procedure”
    - So prototype?
    - Safety committee we need to notify someone
      * She said that she can do it
      * Can we bring samples somewhere to test?
    - Jun likes the idea of letting professionals handle the LOX
    - PAy attention to how much epoxy we use (maybe less is more)
    - Add more to the reading list. (EXPAND the list)
    - We can tour her lab any time
      * (Next Tuesday)
    - Record everything we do every time we layup( time, temp amount of epox, etc.)
      * Change one thing at a time
      * Have a methodical way of laying up
  + Other things about presentation
    - Epoxy is reactive
    - Material selection has been done by erin (PTFE is ideal place to start)
      * We might be able to get someone to machine for us
    - Stuck with aluminum endcaps.
    - Tank inside the module is not what erin wants. We make the module the tank.
    - Opt program has given us dimensions
    - We may share LOX resource with other PSAS team
    - Thin aluminum liner(back up)
    - Sketch tank design for a week Starting today!
    - Add layup challenges to GANNT
* We talked about lab space
  + Laser fire
  + We need to be able to have access to the room

**1/12/17**

First meeting with Professor Jun Jiao.

Main topic: Oregon Space Grant Consortium project proposal.

-Quantify 2:1 funding from PSAS crowdfunding donations.

-Emphasize that we are building off of a previous capstone and we have available resources and support.

-Define clear team member roles

-Provide team member info to show that we are an impressive group

*1/11/2017 12:00 PM -- Google Hangout Meeting with Alex, Joseph, Russell, and Francesca*

OSGC Proposal

Discussed how to move forward with OSGC proposal:

* We will be sticking with Jun Jiao as Advisor - Alex is emailing her, providing her with additional information so she can complete her letter before Friday. Probably no meeting due to snow - we are offering to meet via video chat tomorrow (Thursday, the 12th)
* Trying to model our proposal after fuel pump team’s - Alex is emailing them to see if they will allow us to look at their draft.
* Still waiting on email response from Andrew with clarifying questions about proposal (matching funds, etc).
* Russell is taking lead in researching materials and quotes to add to BOM - anyone with time to do so should try and contribute to BOM.
* Agreed to ‘meet’ up again at 9PM to discuss progress.

Contacts: contact sheet added by Alex to drive- everyone should add their email and phone #

Reminder: Please add weekly availability to ‘availability’ doc, if you haven’t already.

**1/5/17**

Oregon Space Grant Paper

http://spacegrant.oregonstate.edu/student-research-projects

-We need to start writing (due Jan. 13)

-We need to come up budget

-materials

-AIAA registration

-Faculty support options

-Gerry

-Weislogel

-Raul Cal

-Andrew (if necessary)

-Wern

We should write the faculty support letter.

Material

Find pricing for liner test materials:

-PTFE

-ETFE

-PET

-cryogel as an insulation layer/barrier

-We can create test strips to test adhesion

Design

We have to figure out an endcap design

-does it depend on the material we select

Schedules

-Enter winter term weekly schedule into google sheet

**11/15/2016**

Rocket Capstone

Target altitude of 100km

Build a hobby rocket that will go to space

Rocket equation V=Veln(mo/mf)

Tank Prototype

* Small scale test tank that demonstrates the design
* Not responsible for plumbing
  + There is help available
  + We do need a fill valve and purge valve
  + Machine endcaps with gasket
* We have an idea
  + On diameter (about 10”)
  + Flow rate
  + Volumes
* Rocket equation V=Veln(mo/mf)
  + The only change in mass is in the tank
* Without the fuel pump we would need about 700 psi
  + Shoot for at least 50 psi (more is better)
* End caps do not need to be a composite
  + Bolted on maybe, or something else any ideas?
* Low tech
* Composites are stronger and lighter
* Hydrotesting will need to be done
* We will also need to do a cryo fill
  + We can observe the behavior of our lining and its interaction with the composites
* Internal geometry
  + Baffles
    - Slosh
    - Vortex
* Make lots of prototypes and test them
* Lots of materials properties data has been collected
* We want a 2.5 factor of safety
  + We will need to estimate the in flight loading

BIG PROBLEMS

* Epoxy is not LOX safe
  + We will need some sort of liner
    - No diffusion or leaks or bad things will happen
    - Watch the interfaces for leaks
* Account for thermal contraction and expansion
  + Perhaps have a slightly larger liner than shell to allow for shink

Document everything

* Open source project
* We want to leave something that future generations can benefit from

This is not a project for someone who wants an easy one. Lots of time will need to be put into this

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