

# Kimchi

Propulsion Systems(?)

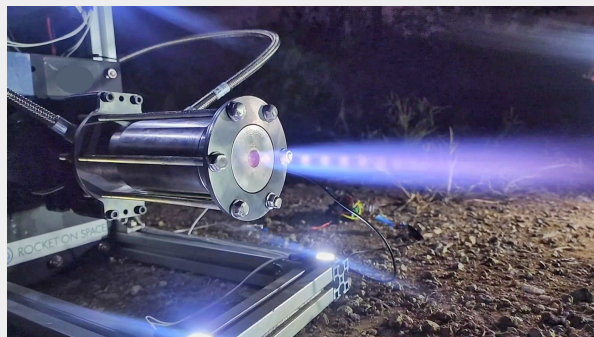
## Presentation for Innospace

## Paichai High School (2025~)

### Experience & Awards

- Samsung humantech paper award(32th) - Gold prize
- Overpace Kaist - Researcher
- Bi-propellant rocket development
- GNC test platform development

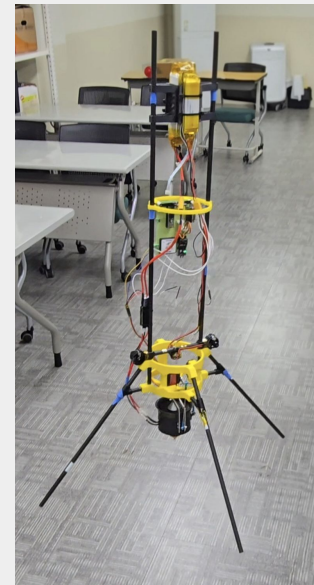
# Introduction - Wonbee



Liquid Rocket R&D



Solid Rocket R&D



GNC R&D

## ERAU (ME Propulsion) - Prescott

- 2023~2025
- Dropped out to build a software startup

## Experience

- RDL(Rocket Development Lab) Liquids Technical Committee
- RDL Liquids Research Financial Officer
- Liquids Bootcamp (8-week Course)
- Chimp Propulsion (Various propulsion projects)

# Introduction - Hyunsoo

**Kimchi**  
Propulsion Systems(?)

**ROCKET PROPULSION**

**EMBRY-RIDDLE**  
FLORIDA INSTITUTE OF TECHNOLOGY

**LIQUIDS BOOTCAMP**

COMPREHENSIVE LECTURE SERIES FOR LIQUID FUELED ROCKET PROPULSION

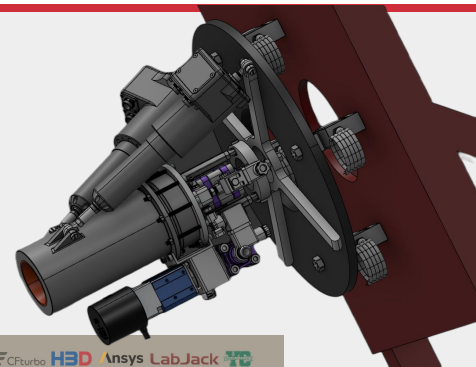
4/8

**SATURDAY 10/19**  
SEC 1 11:00 AM - 12:00 PM  
SEC 2 1:00 PM - 2:00 PM

**SUNDAY 10/20**  
SEC 3 2:00 PM - 3:00 PM

**BUILDING 17 ROOM 123**

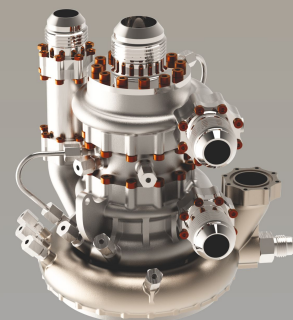
**HYUNSOO YOO**  
YOONH@MY.ERAU.EDU

HABONIM CFturbo H3D Ansys LabJack 10

**Open Cycle Gas Generator  
Turbopump Assembly**

BY CHIMP SPACE AT ERAU PRESCOTT



EMBRY-RIDDLE [WWW.LINKEDIN.COM/COMPANY/CHIMPSPACE/](http://WWW.LINKEDIN.COM/COMPANY/CHIMPSPACE/)  
3700 WILLOW CREEK RD 86301 ARIZONA, USA

**INNO SPACE**  
SPACE FOR INNOVATION, INNOVATION FOR SPACE

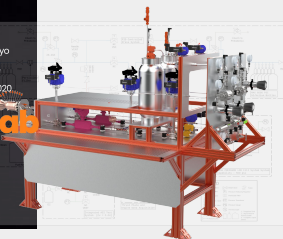
Flight Duration: 70 seconds  
Payload: 100m  
Fuel: Propyl Alcohol  
Oxidizer: Liquid Oxygen  
Dry Weight: 50 kg  
Crew: 2  
Total Mass: 200 kg  
Total Materials: 3336 DMLS  
Structural Materials: AIG001  
Production: 10-12

**Chimp  
Lander**

Perfectly  
perfectly

Max Thrust: 1000 lbf  
Max Pressure: 1000 psi  
Fuel: hydrocarbons  
Oxidizer: Gaseous Nitro  
Tank Volume: 23 l  
Regulator Type: Solenoid  
Tank Material: SS304  
Structural Material: SS304  
Max Source: 10000 psi

**Boostlab  
Core1**



Advance Korea's student level LFRP projects & teams

Build a LFRP test system for Korean teams

Become Korea's first team to fly a propulsive lander

Introduce the international rocketry community of Korea power

# Competition(s) Overview

## Race 2 Space (UK)

- 40+ teams attend
- Liquids, Hybrids, Turbopumps, and more

## Lander Challenge (US/International)

- 6 teams have won prizes so far
- Numerous teams are “planning” to attempt

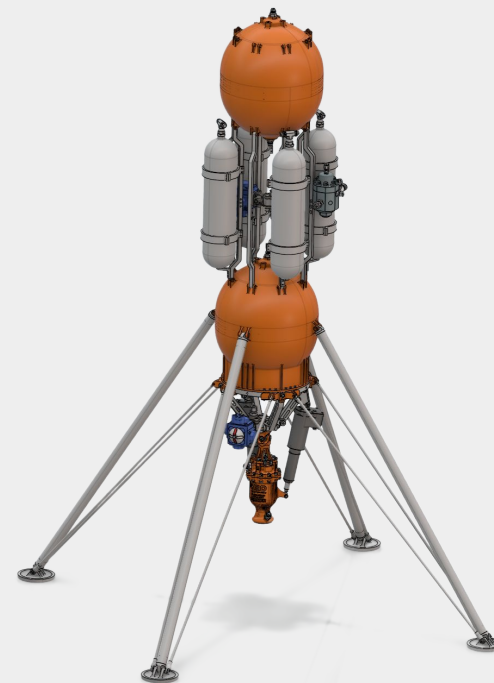
# Competition(s) Overview

|                                  |
|----------------------------------|
| Baseline                         |
| TVC Hotfire (\$15k)              |
| Throttleable Hotfire (\$15k)     |
| The Bess Touchdown Award (\$25k) |
| Tethered Hover (\$25k)           |
| Hop (\$50k)                      |



# Lander System Overview

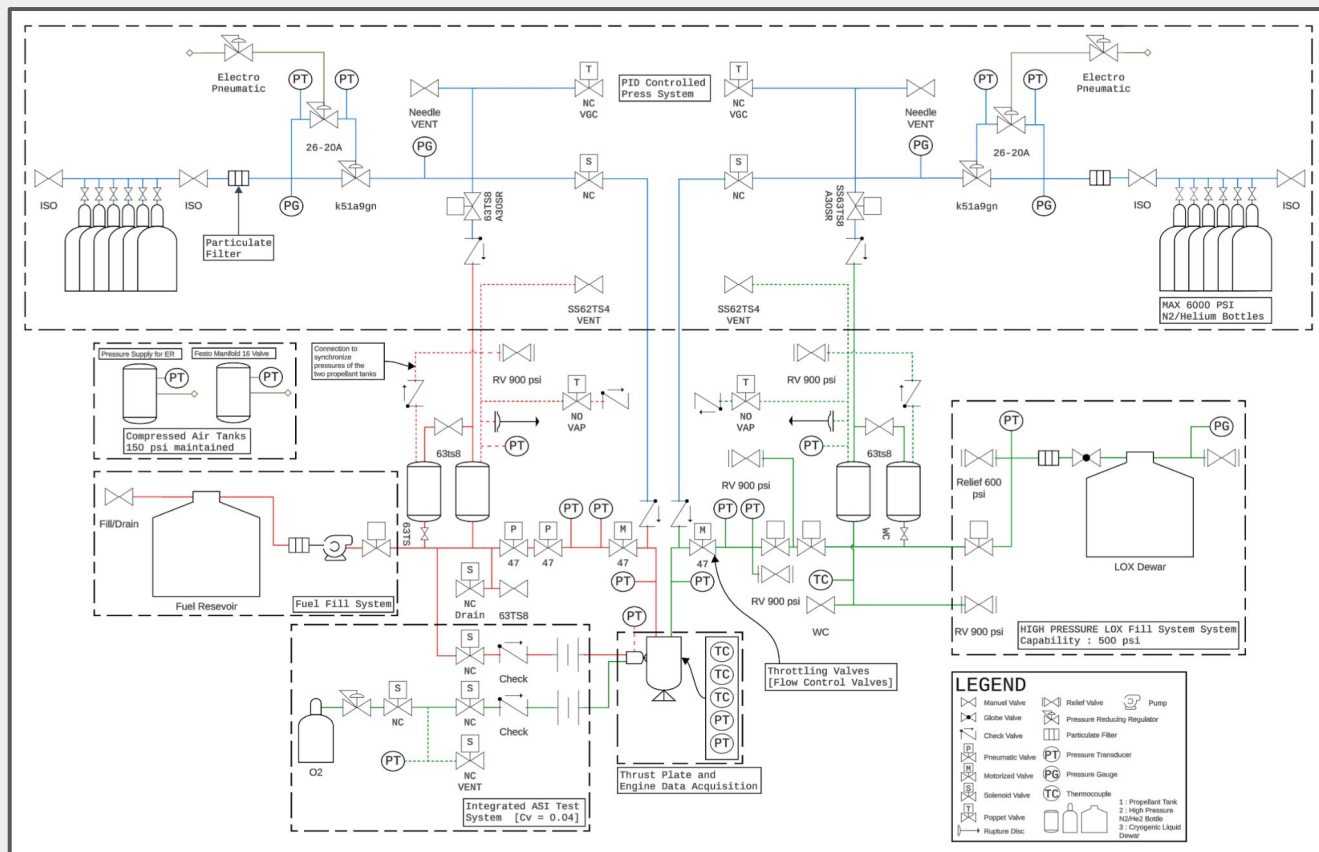
|                    |                |
|--------------------|----------------|
| Dry mass           | 160kg          |
| Wet mass           | 240kg          |
| Flight duration    | ~ 60s          |
| Landing velocity   | < 2m/s         |
| Tank configuration | Pressure-fed   |
| Pressurant         | N <sub>2</sub> |
| Tank material      | AL - 6061      |



# Kimchi

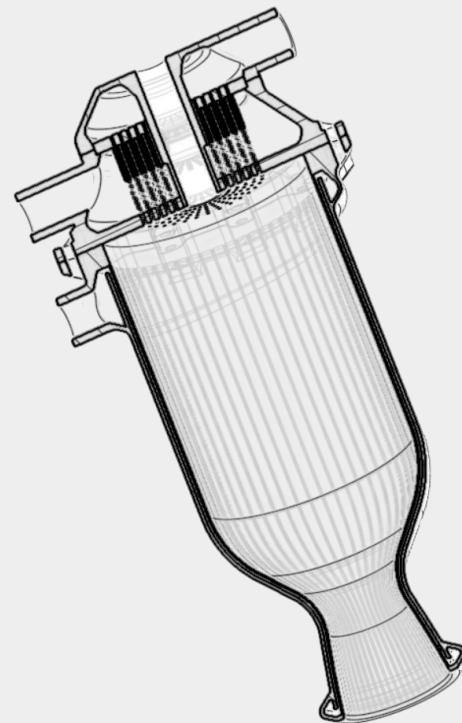


# Lander System Overview

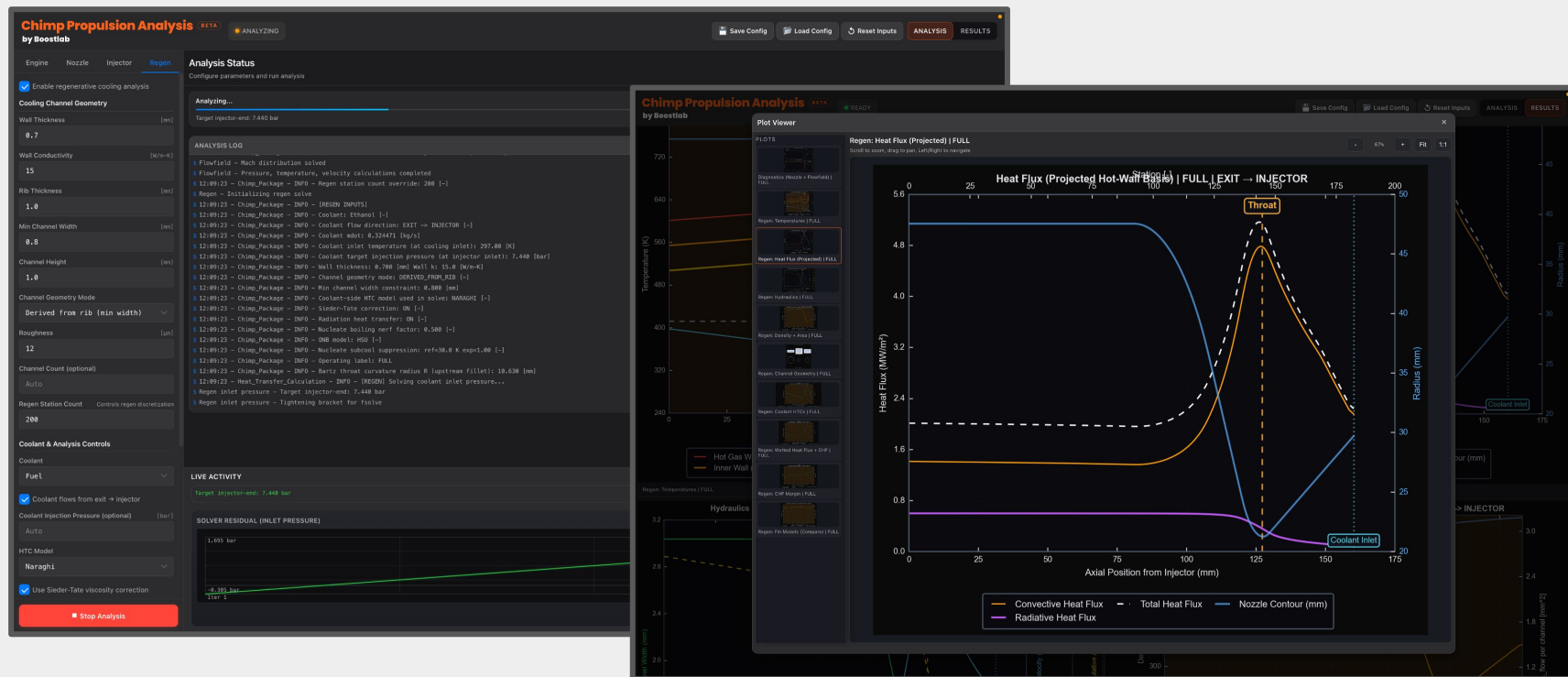


# Engine Overview

|                      |                     |
|----------------------|---------------------|
| Propellants          | LOx / Ethanol(PDMS) |
| Nominal Thrust       | 2.5kN               |
| Nominal Pc           | 15 bar              |
| Minimum Throttle     | 40%                 |
| Total Mass Flow Rate | 1.37 kg/s           |
| Injector Type        | Coaxial Shear       |
| Cooling Method       | Regenerative (fuel) |
| Chamber Material     | IN718 (DMLS)        |



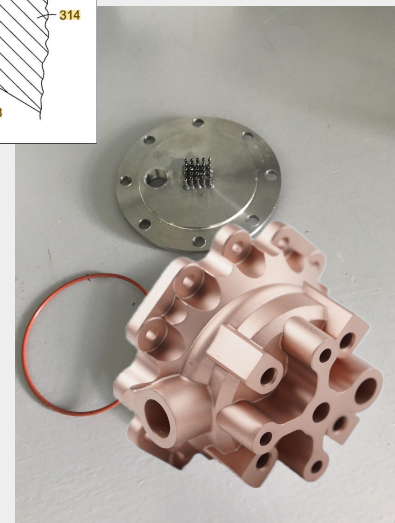
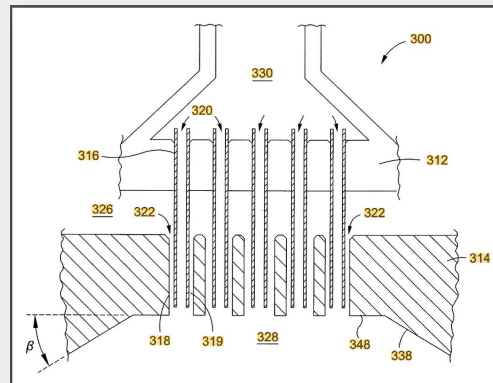
# Chamber Thermal Analysis



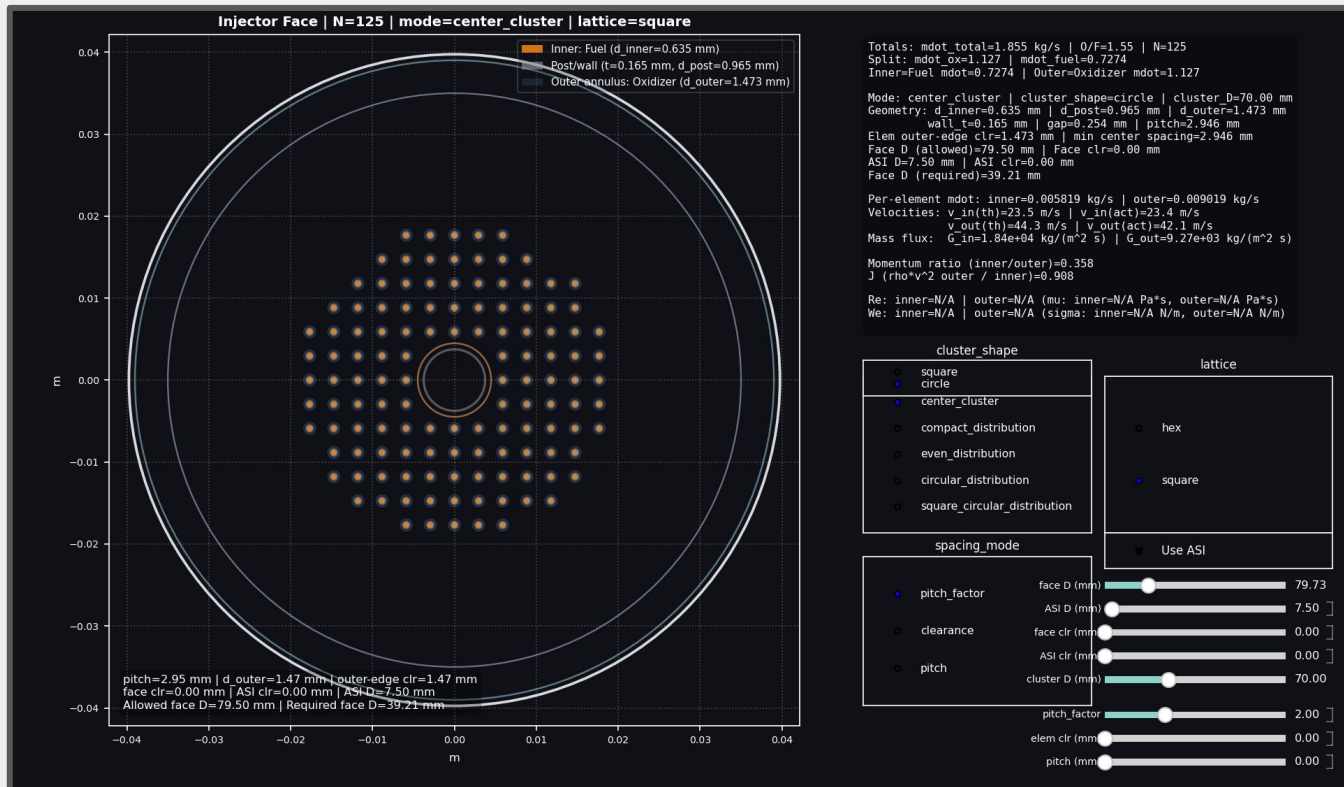
# Injector Overview

## Coaxial Shear Injector

- Hypodermic needles
- Vacuum brazing
- Multi part injector leveraging both DMLS and traditional manufacturing



# Injector Overview



## Race 2 Space (UK)

- Very few international teams outside of EU
- More of a “friendly technology sharing” type competition

## Lander Challenge (US/International)

- No one has attempted the last three challenges
- Multiple teams working on building the lander
- Many stuck due to large team size and bureaucracy

# Our Requests

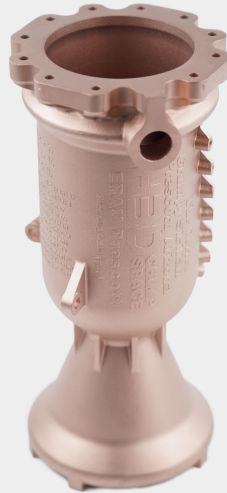
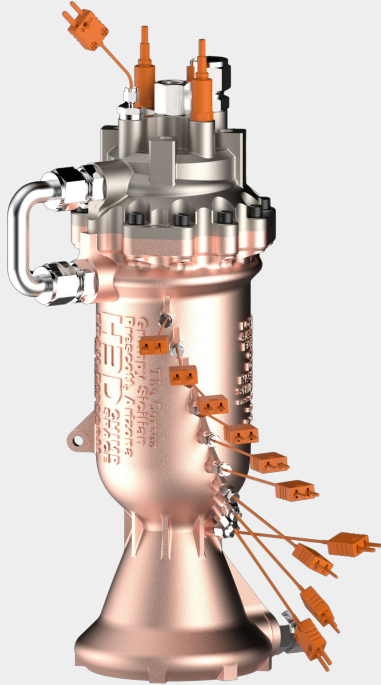
1. 3D printed components
2. Access and assistance for machined parts
3. Propulsion Mentorship
4. Design Reviews

1. Flight-adjacent long duration testing of :
  - a. IN718 printed regeneratively cooled liquid fueled rocket engine
  - b. Flight demonstration of a fully additively manufactured propellant tank structure
2. End-to-End VTVL Flight Test Data & Development Program
3. Positive Domestic Outreach & Educational Impact
4. International Media Exposure for INNOSPACE

# Closing & Discussion

Thank you!

# Appendix (1)



# Appendix (2)

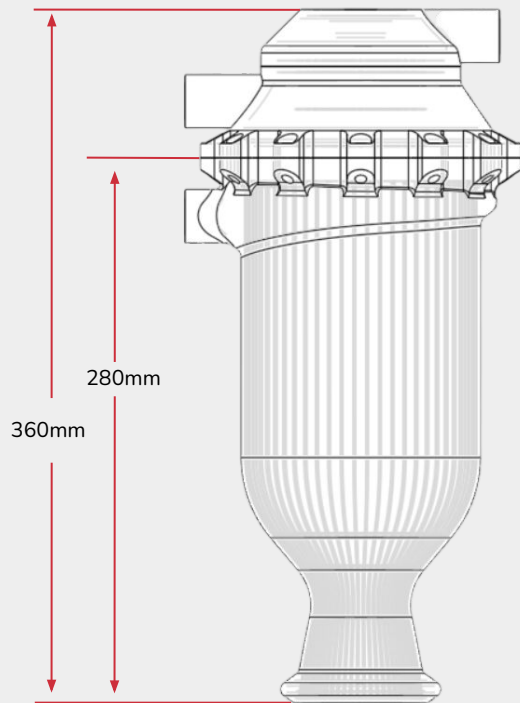


# Appendix (3)

## Build Volume

- $W \times D \times H = 180 \times 180 \times 280\text{mm}$  (min)
- Part Qty = 4
- Chamber mass = 2.8kg
- Injector mass = 1.6kg

This is not a final version and may change in the future.



# Appendix (4)

**Kimchi**  
Propulsion Systems(?)

LIQUIDS  
BOOTCAMP

**KEYENCE**

INDUSTRY DAY AT LIQUIDS BOOTCAMP

DATE: **NOVEMBER 21TH 3:00PM** (THURSDAY)  
LOCATION: AXFAB (MACHINE SHOP)

**AGENDA:**  
Keyence engineers are visiting to give us a demo of their **3D scanning** equipments.

**BRING YOUR OWN PARTS:**  
Bring your manufactured part to test how terribly off your part is in comparison the the 3D model of your part (STEP).

Gauge blocks & pins are banned.  
It has to be your own. No cheating.



EMBRY-RIDDLE AERONAUTICAL UNIVERSITY HYUNSOO YOO [YOOH@MY.ERAU.EDU]  
EMAIL OR TEAMS FOR ANY QUESTIONS

EMBRY-RIDDLE AERONAUTICAL UNIVERSITY HABONIM Industrial Valves & Actuators

INTRODUCING CHIMP SPACE SYSTEM'S  
NEWEST LACTOSE FREE ENGINE

**HAM-1**

CFturbo AIAA Swagelok mirae Red Bull H3D

PEPSI LabJack KeyS YC SAE INTERNATIONAL Ansys

LIQUIDS  
BOOTCAMP

**Swagelok**

INDUSTRY DAY AT LIQUIDS BOOTCAMP

DATE: **NOVEMBER 7TH** (THURSDAY)  
LOCATION: **DLC AUDITORIUM**

## TIMELINE

[2:00 ~ 3:00PM] SWAGelok INTRO & BASICS  
[3:00 ~ 4:00PM] PROPELLANT SUPPORT SYSTEMS  
[4:00 ~ 5:00PM] N2 REGULATION & VEHICLE SUPPORT  
[5:00 ~ 5:30PM] SWAGE-OFF!

\*Do you think you've got what it takes to be the best swagelok technician on campus?

A total of 10 students will compete to swage identical tube & fitting sets. The last of the assembly to burst with a hydrostatic test wins this competition!

[5:30 ~ 6:00PM] TEST YOUR OWN MINI ROCKET ENGINE!

\*Limited spots for 30 students! Contact **Hyunsoo/Harry** before **Friday(Nov. 1)** for this opportunity!

\*\*You will be required to attend an additional special bootcamp session the day before this swagelok event in order to design, manufacture, and test on November 7th\*\*

## THE VISITORS



Tim Sullivan  
Account Manager



Patrick Mylott  
Field Engineer

## SWAGelok SOUTHWEST



4926 E. Beverly Road, Phoenix, AZ 85044  
(602)-268-4848  
<https://southwest.swagelok.com/en>

EMBRY-RIDDLE AERONAUTICAL UNIVERSITY HYUNSOO YOO [YOOH@MY.ERAU.EDU]  
EMAIL OR TEAMS FOR ANY QUESTIONS

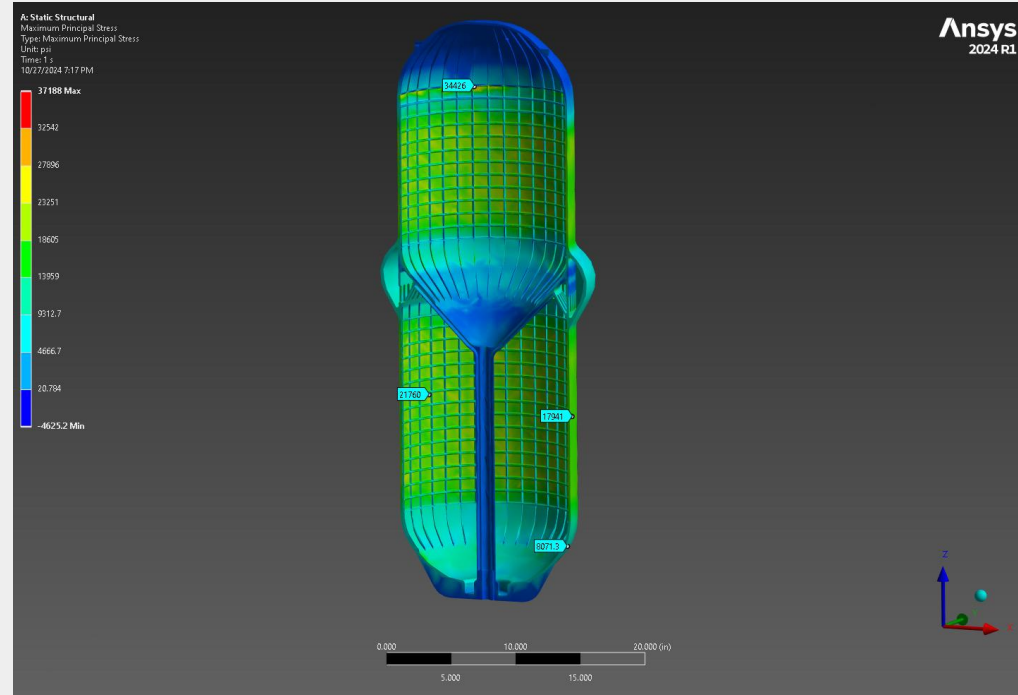
IT IS COMING SOON!  
LANDER ENGINE PRINTS SPONSORED BY:

**H3D**

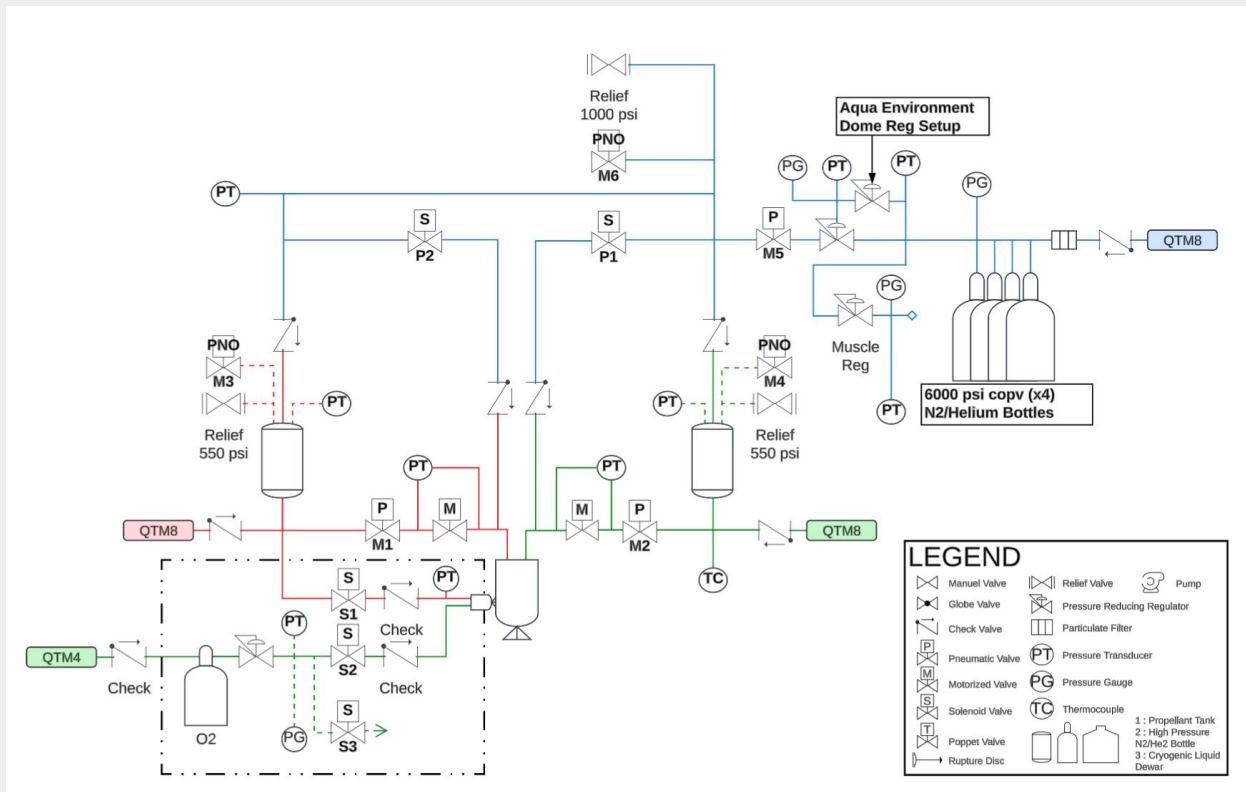
Chimp Space Systems is proud to announce HBD as the newest industry sponsor. We are hugely excited for this new partnership; this will only be the beginning of collaboration.

**innospace**  
SPACE FOR INNOVATION, INNOVATION FOR SPACE

# Appendix (4)



# Appendix (5)



# Appendix (5)

