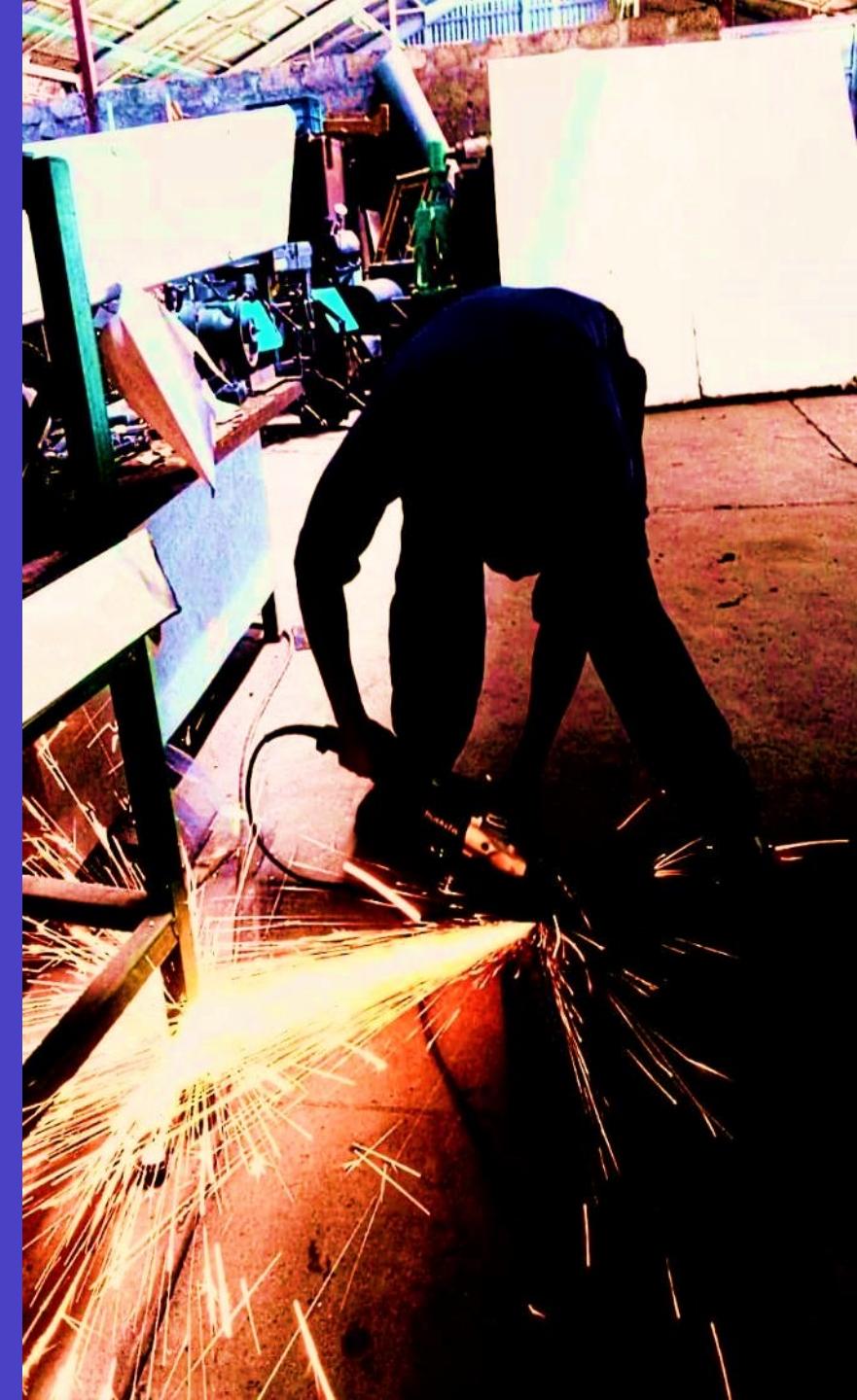


WEEK 4 SOLID TEAM REPORT

NAKUJA PROJECT



WEEKLY OBJECTIVE S

COOKING

- COOKING OF GRAINS

TEST STAND

- CALCULATIONS AND WELDING

MOTOR HOLDER

- MAKING A NEW ALUMINIUM
MOTOR HOLDER

DISASSEMBLY AND ANALYSIS

- MOTOR DISASSEMBLY AND
STATIC TEST RESULTS
ANALYSIS

IGNITION CIRCUIT

- PREPARATION OF IGNITION
CIRCUIT AND IGNITORS

NOZZLE

- SIMULATION OF AIR FLOW IN
THE NOZZLE

#40 COOKING OF THE GRAINS



- Three grains were cooked and casted

COOKING OF THE GRAINS

PREVIOUS GRAINS

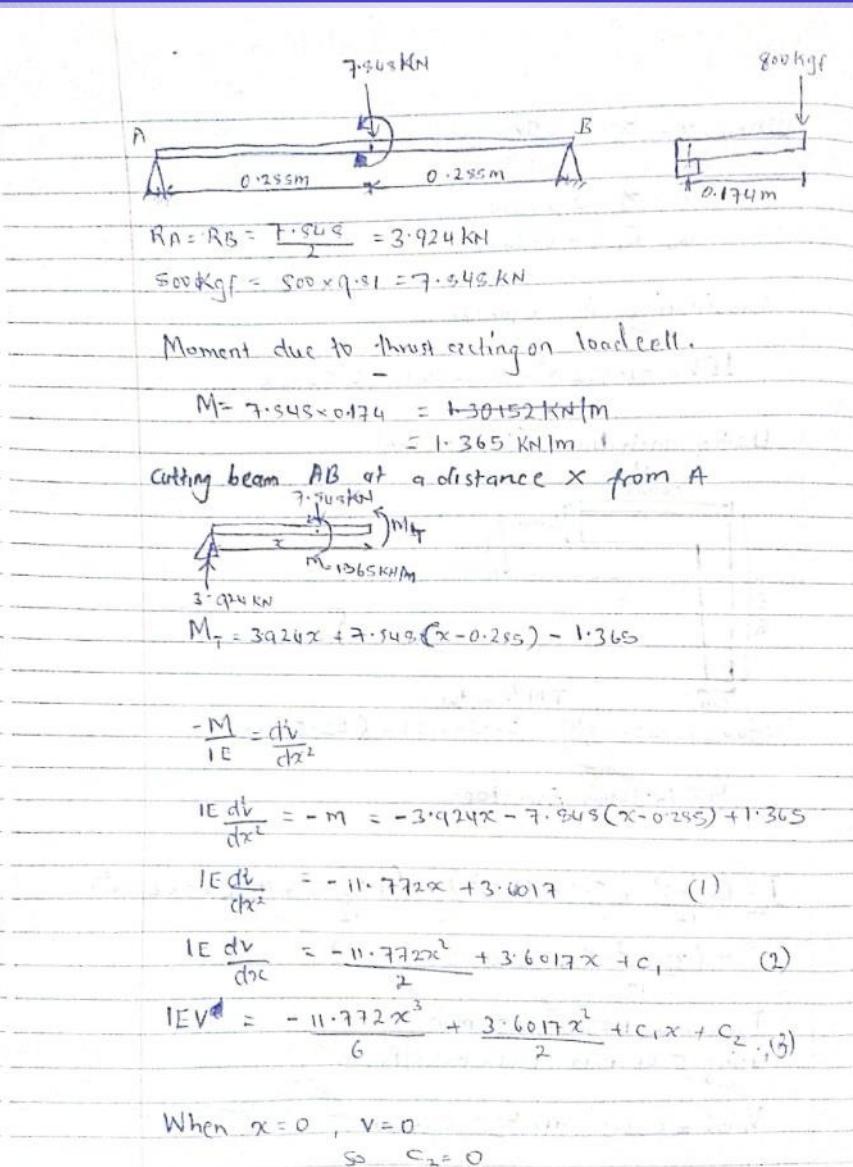


CURRENT GRAINS



#55 TESTSTAND CALCULATION

CALCULATION OF THE ANGLELINE BAR SUPPORTING LOADCELL ON THE TESTSTAND



When $x = \frac{l}{2} = 0.285 \text{ m}$, $\frac{dv}{dx} = 0$

$$x = \frac{l}{2} = 0.285 \text{ m}$$

$$C_1 = -0.5484$$

Substituting in eqn. (3)

$$IEV = -1.962x^3 + 1.90055x^2 + 0.5484x$$

Using angleline (50x50x5mm)

$$(50 \times 5) + (45 \times 5) \bar{y} = (50 \times 5 \times 2.5) + (45 \times 5 \times 7.5)$$

$$\bar{y} = 14.34 \text{ mm from top}$$

$$I_{zz} = \left(\frac{50 \times 5^3}{12} + 50 \times 5 \times 10.84^2 \right) + \left(\frac{45 \times 5^3}{12} + 45 \times 5 \times 6.67^2 \right) + \left(35.66^3 \times 5 + 35.66 \times 5 \times 17.93^2 \right)$$

$$I_{zz} = 112502.7433 \text{ mm}^4$$

Using E of mild steel = 200 GPa,

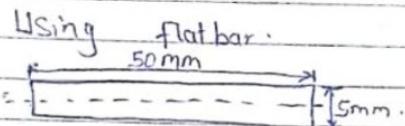
V_{max} occurs at $x = \frac{l}{2} = 0.285 \text{ m}$.

TESTSTAND CALCULATION

$$IEV = -1.962(0.285^3) + 1.90035(0.285^2) - 0.5434(0.285)$$

$$V = \frac{-0.05449}{200 \times 10^9 \times 1125.02 \cdot 7433 \times 10^{-12}}$$

$$V = \cancel{0} = 2.4217 \times 10^{-6} \text{ m}$$
$$= 2.4217 \times 10^3 \text{ mm.}$$



$$I_{zz} = \left(\frac{50 \times 5^3}{12}\right)$$

$$= 520.833 \text{ mm}^4$$

$$IEV = -0.05449$$

$$V = \frac{-0.05449}{200 \times 10^9 \times 520.833 \times 10^{-12}}$$

$$V = -5.2704 \times 10^{-4} \text{ m}$$
$$= -0.52704 \text{ mm.}$$

FROM THE CALCULATIONS:

- L-Shaped bar can withstand more force and moment than the flat bar (*minimum deflection on L-shaped*)

#56 REINFORCEMENT OF TESTSTAND

- L-shaped bars used to reinforce the load cell support.





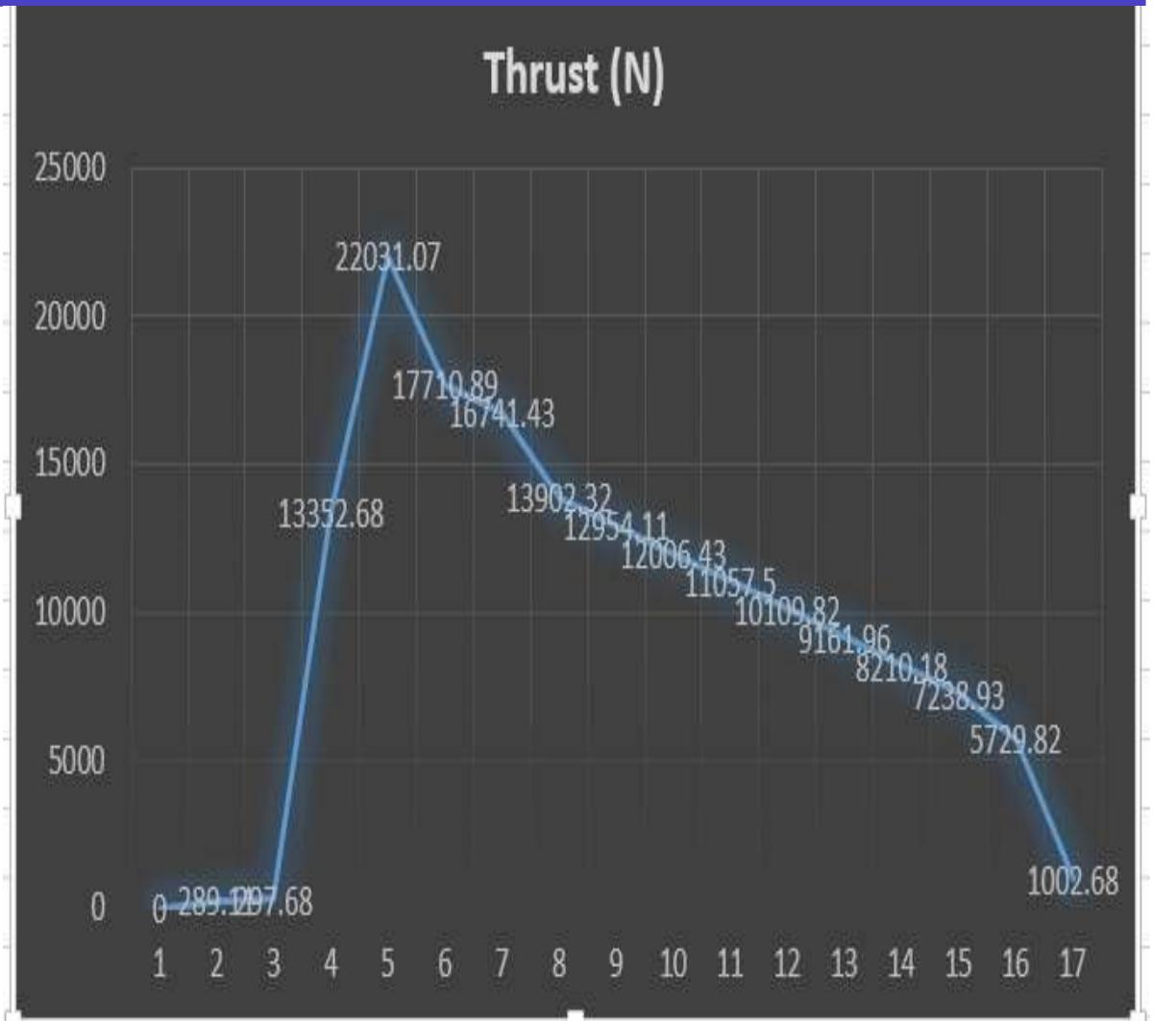
#57ALUMINIUM MOTOR HOLDER

#58MOTOR DISASSEMBLY

GOOD CONDITION	DAMAGED
BULKHEAD AND ITS O-RINGS	NOZZLE O-RINGS
NOZZLE	MOTOR HOLDER
MOTOR CASING	
BOLTS	



#46 STATIC TEST RESULTS ANALYSIS

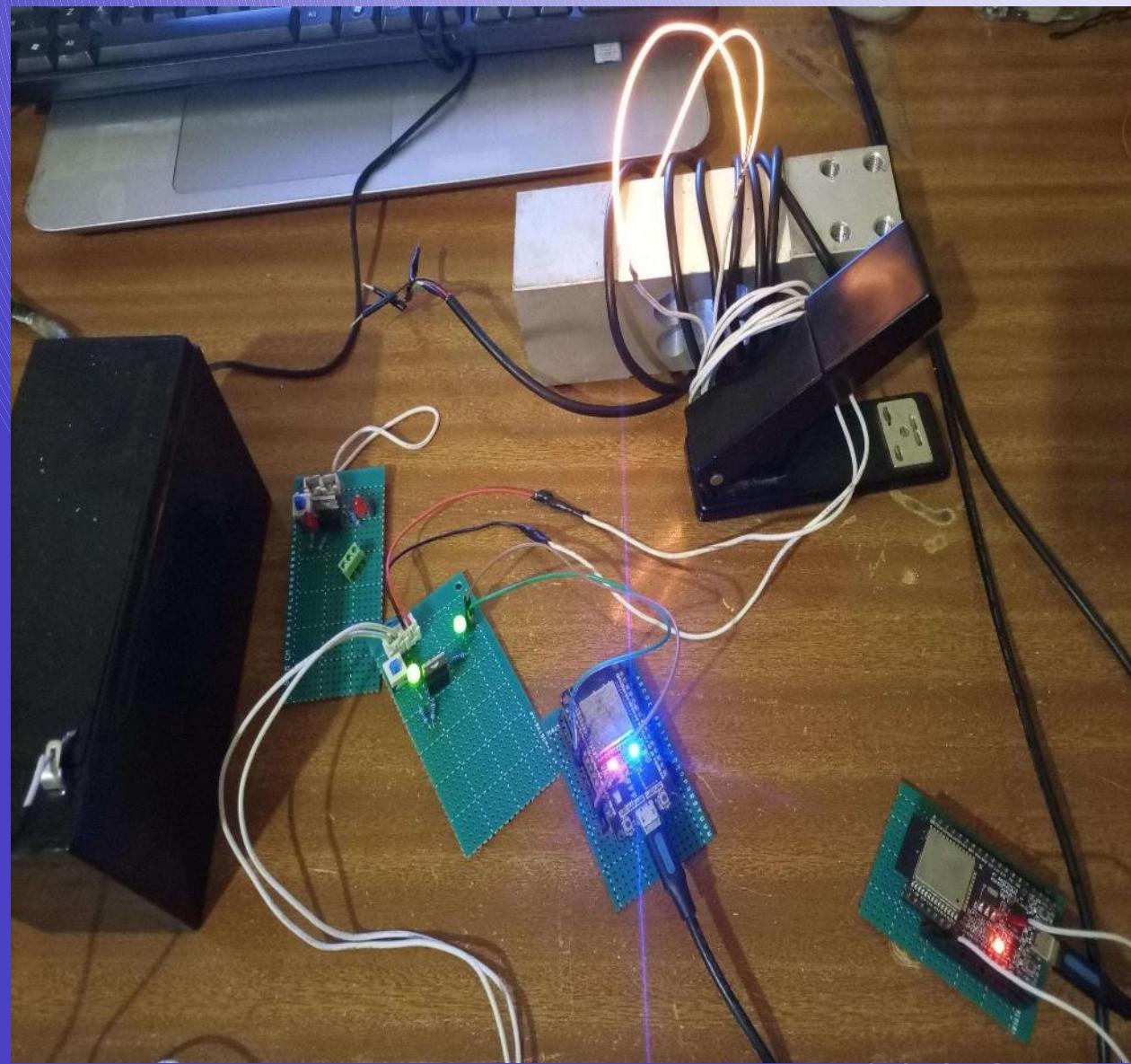


- A maximum thrust of 22.031kgf(216N).
- WHY???

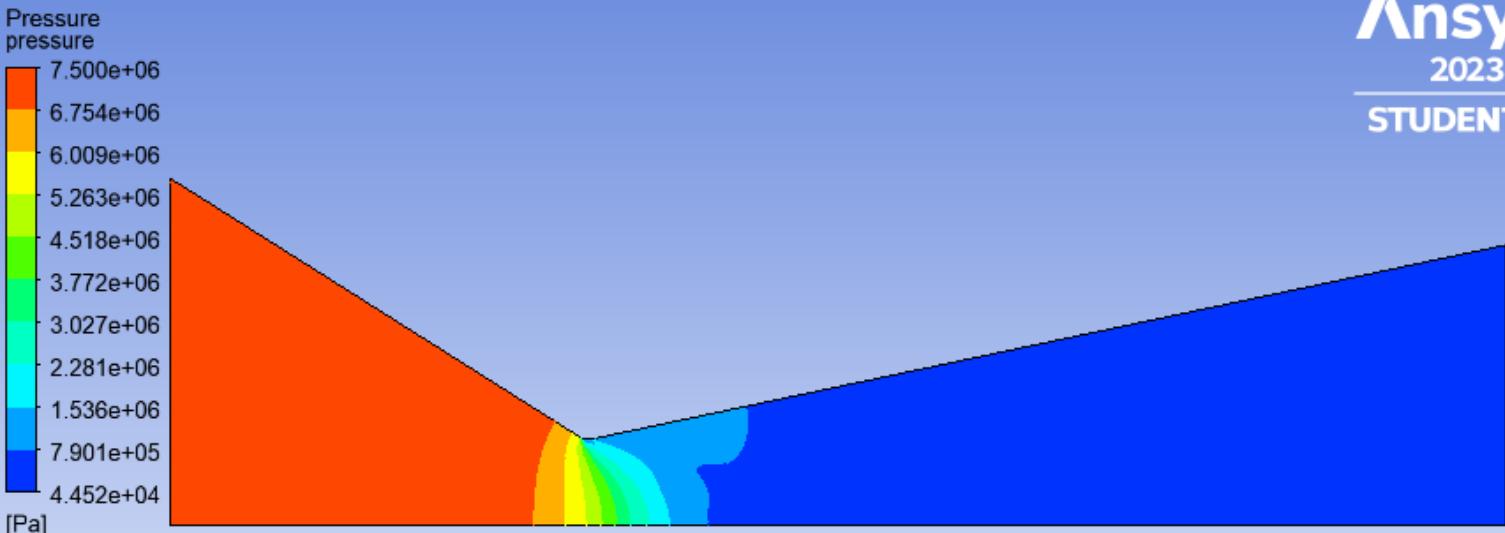


- Failure of the loadcell support at 216N??

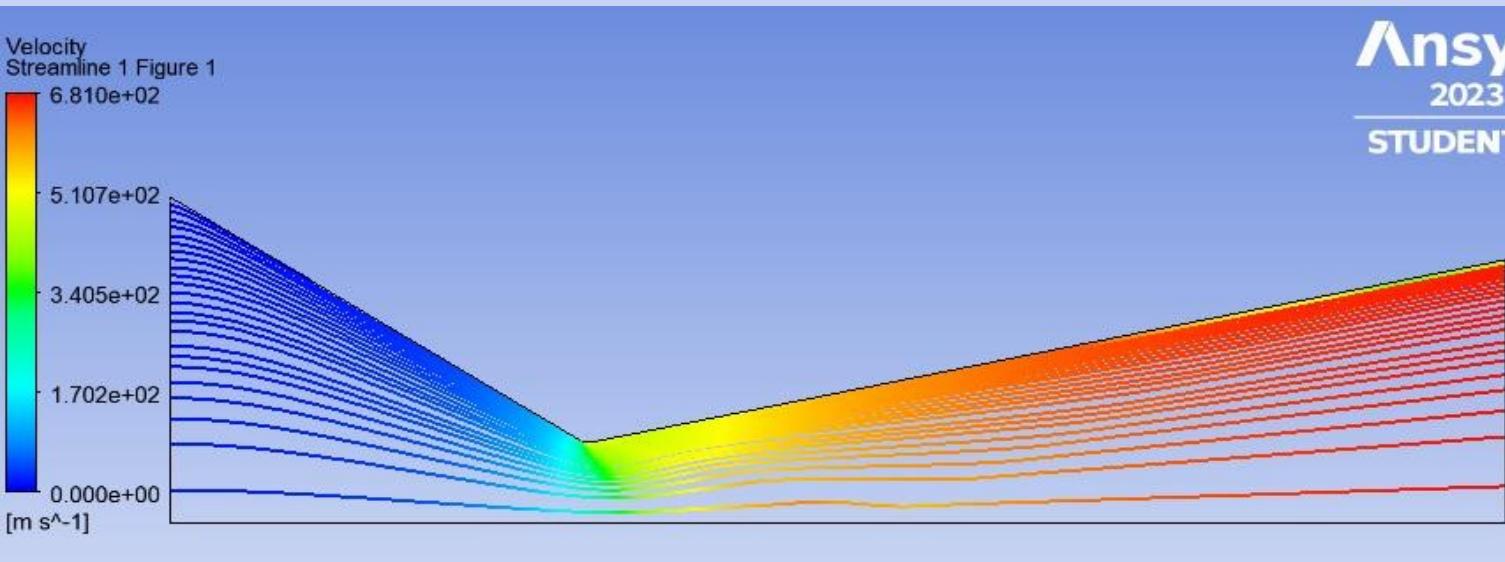
#59 IGNITION CIRCUIT AND IGNITORS



#44 NOZZLE



Ansys
2023 R2
STUDENT



Ansys
2023 R2
STUDENT

BOUNDARY CONDITIONS

Inlet-7.5Mpa gauge

Outlet-101.325KPa(atmospheric)

FINDINGS

The flow of gas at outlet increased to supersonic speed(Mach>1)

The design of the nozzle is okay

CHALLENGE S

- An extra longer power extension cable needed.
- M4-M8 Drill bits required.

NEXT WEEK'S OBJECTIVES

- ❑ Machining of:
 - Nozzles
 - Bulkheads
- ❑ Design of the casting tool
- ❑ Agree on bolting method to airframe
- ❑ Fabrication of ignition circuit
- ❑ Cooking of grains
- ❑ Storage of grains method



THANK YOU