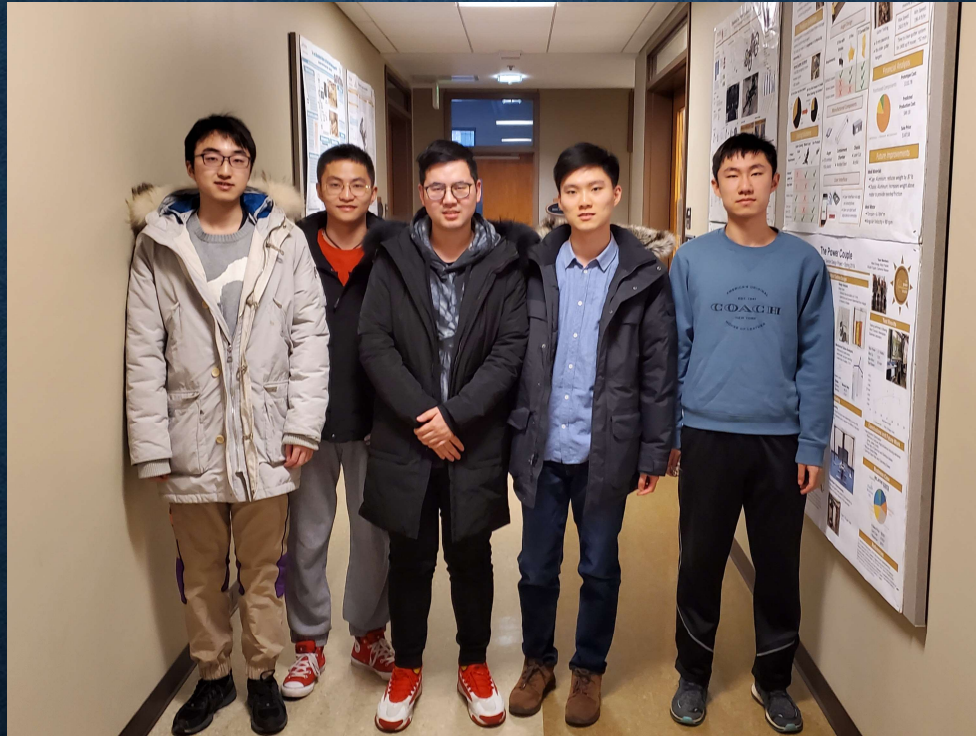




DESIGN OF ANNULAR TRAVERSE SYSTEM

Team steam

TEAM MEMBER



From left to right: Jinchi Zhang, Zihao Xu, Dengfeng Sun, Zhiyang Wen, Zhengwei Chen

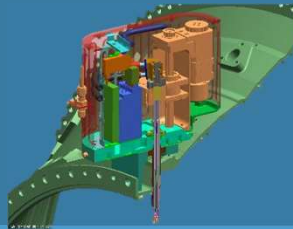
COMPETITION ANALYSIS

Traverse system design by Aerolab



- High accuracy
- Easy to use
- Poor sealing
- Can not move annularly
- 2 degrees of freedom

Traverse system designed by Rolls Royce



- Extremely high accuracy
- Can withstand harsh environment
- 1 degree of freedom
- Extremely expensive.

Traverse system designed by QUADRATEC LIMITED



- High accuracy
- Good sealing
- Three degrees of freedom
- Expensive
- Can not withstand high temperature

CONTENT

I. Problem statement

II. Technical Features

III. Business plan



Problem statement

PROBLEM DESCRIPTION

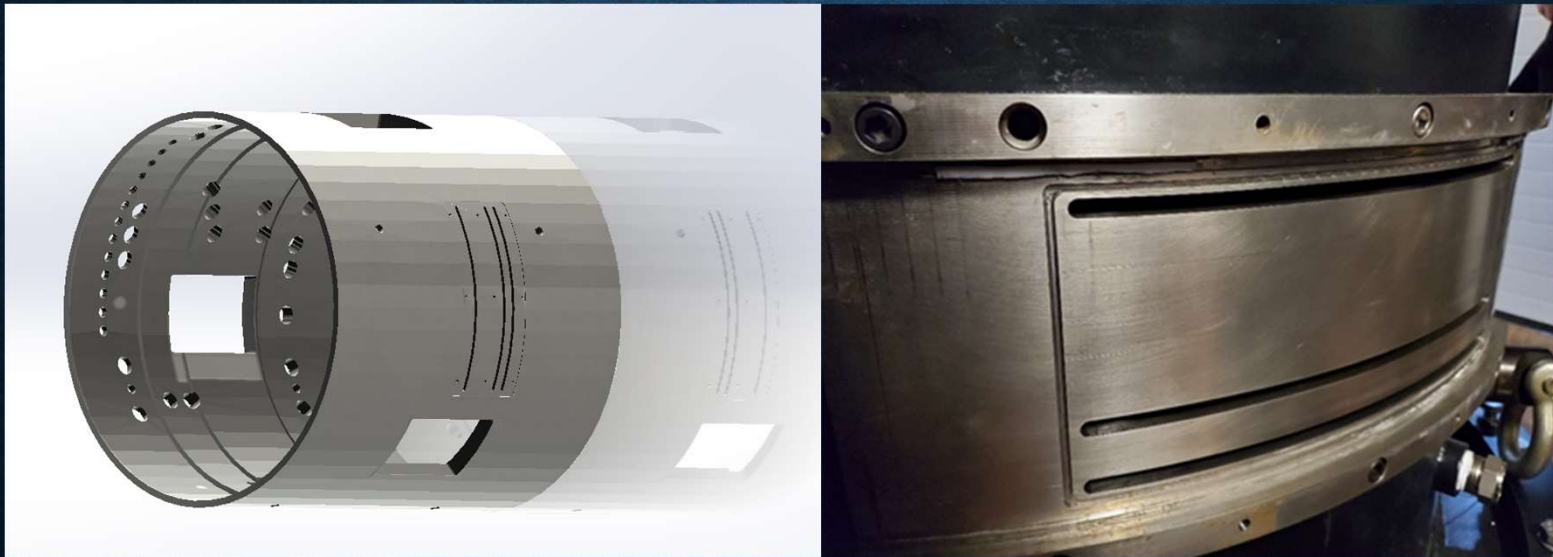


Wind tunnel in Zucrow Lab

Design a traverse system which can move around a cylinder wind tunnel

- 1) Withstand harsh environment**
- 2) Accurate Position measurement**
- 3) Air Leakage Prevention**

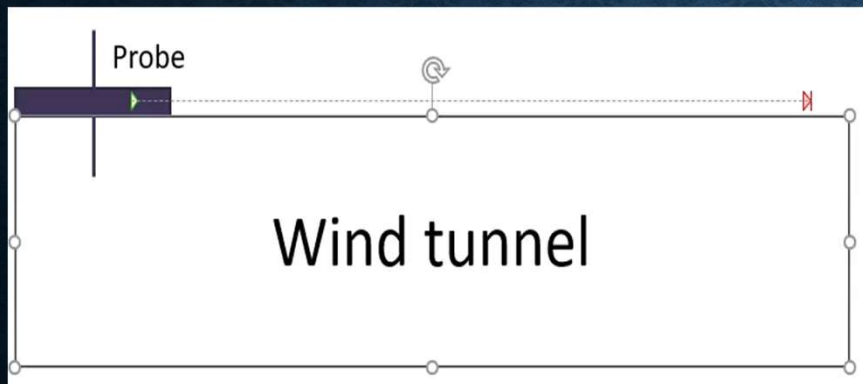
PROBLEM DESCRIPTION



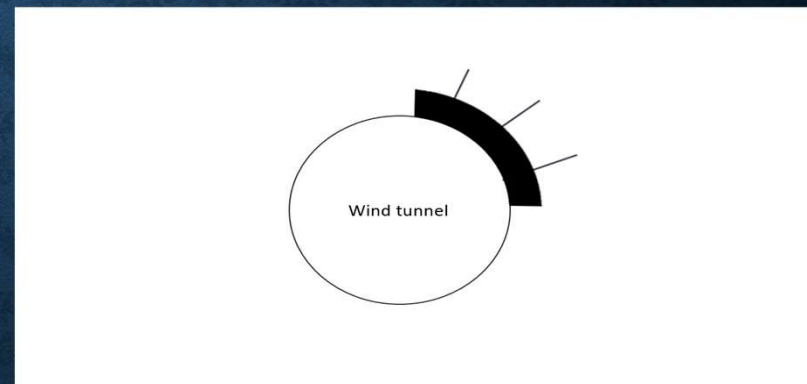
Wind tunnel and slots in Zucrow Lab

PROBLEM DESCRIPTION

Linear traverse system



Circular traverse system

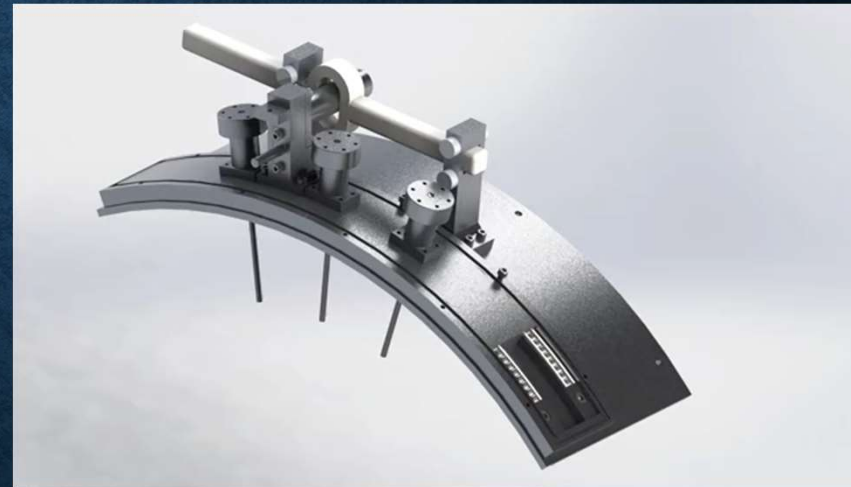
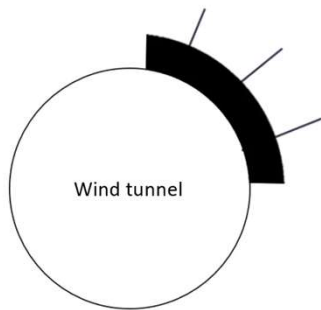


MOTION TRANSFORMATION

Circular motion



Linear motion



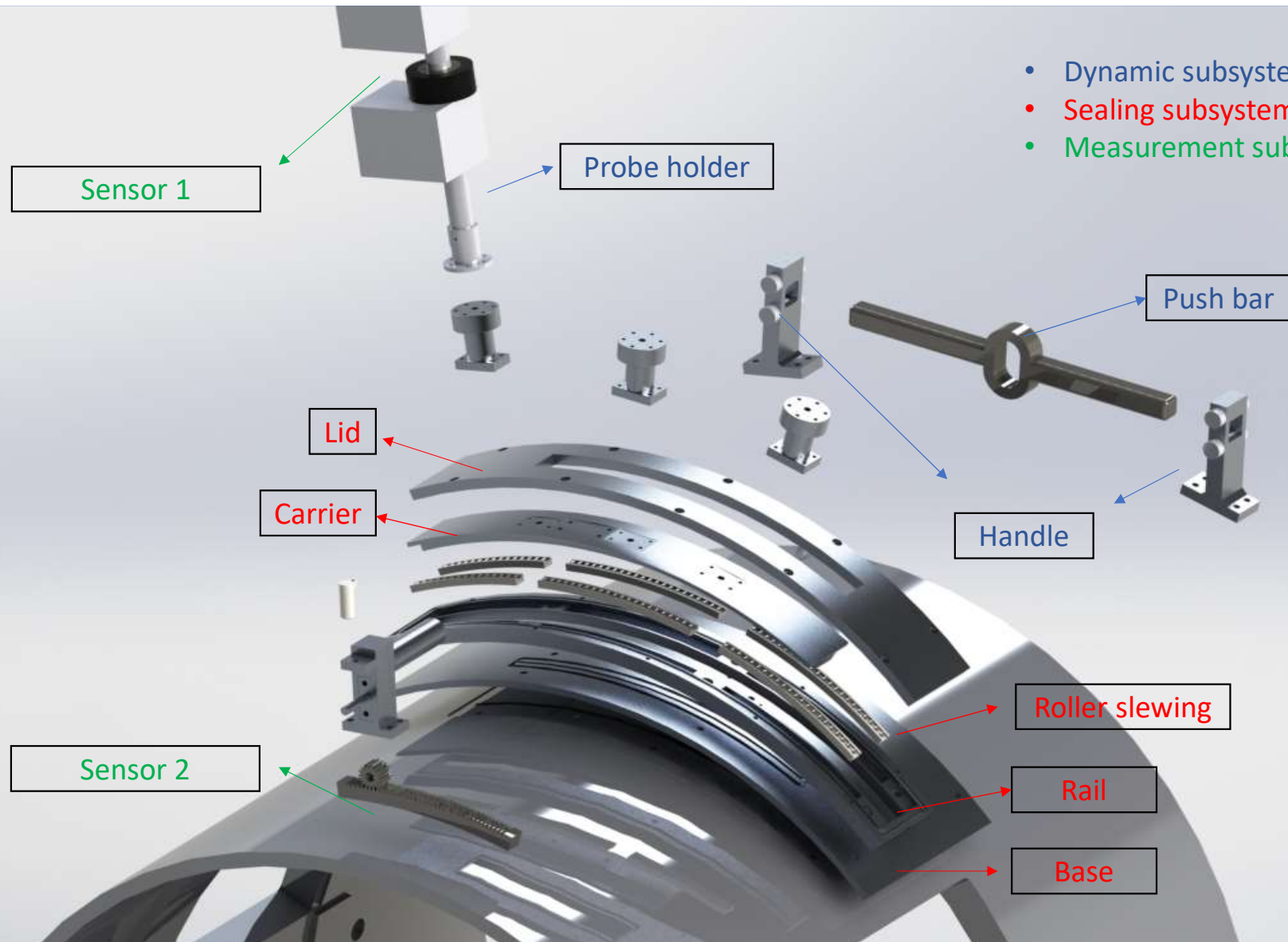


Technical Features

Traverse system

- Dynamic subsystem
- Sealing subsystem
- Measurement subsystem

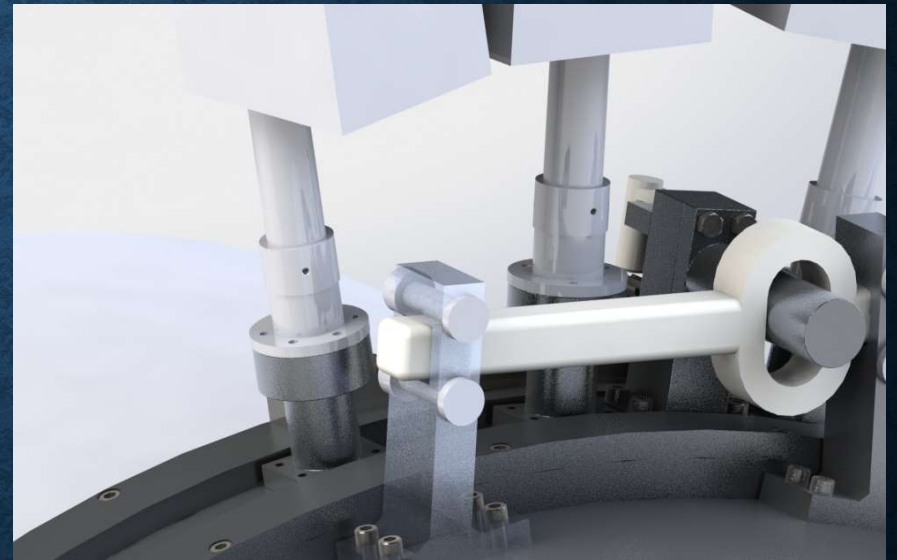
- Dynamic subsystem
- Sealing subsystem
- Measurement subsystem



METAL – METAL CONTACT PREVENTION



Roller slewing ring between carrier and rail



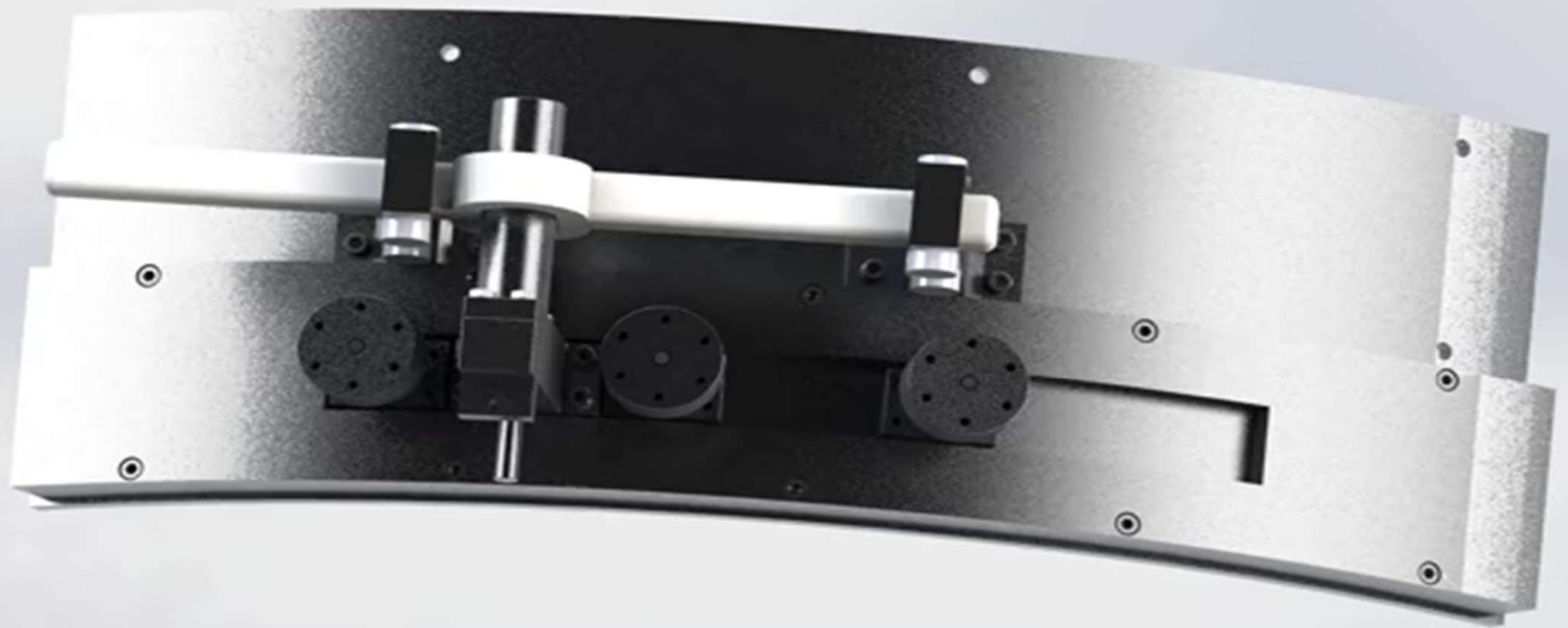
Roller between pushing bar and standing bar

SEALING

How to seal a system with a moving part ?



Gear shift lever



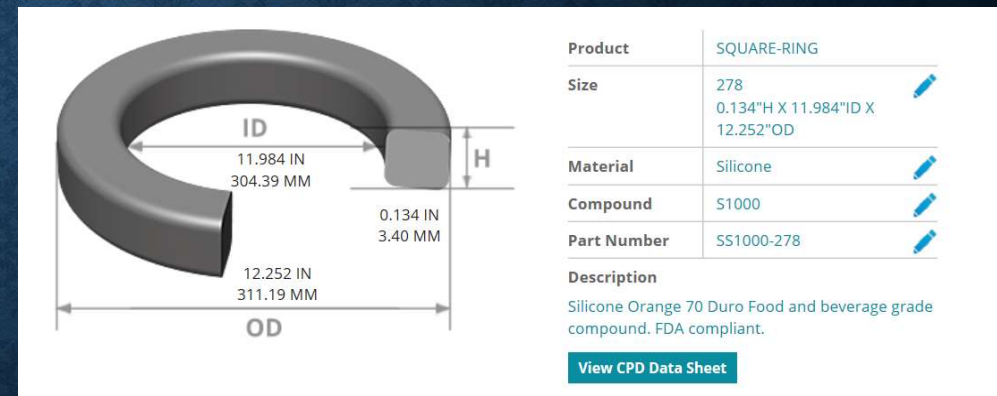
Moving without exposure to environment

SEALING ----- O-RING BETWEEN EACH CONTACT SURFACE

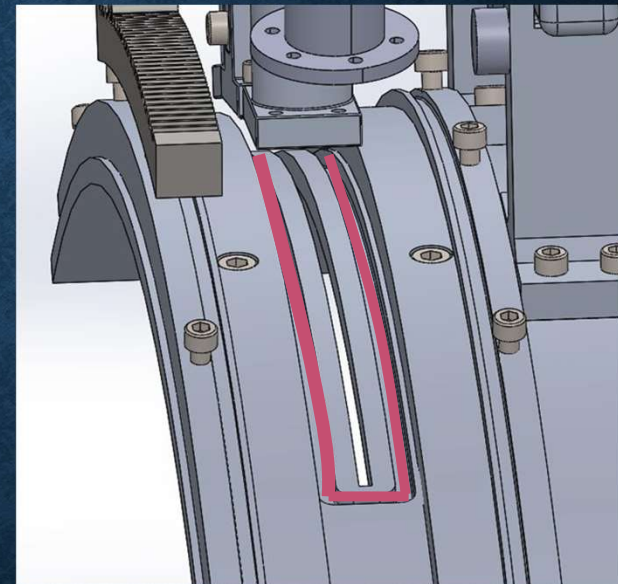
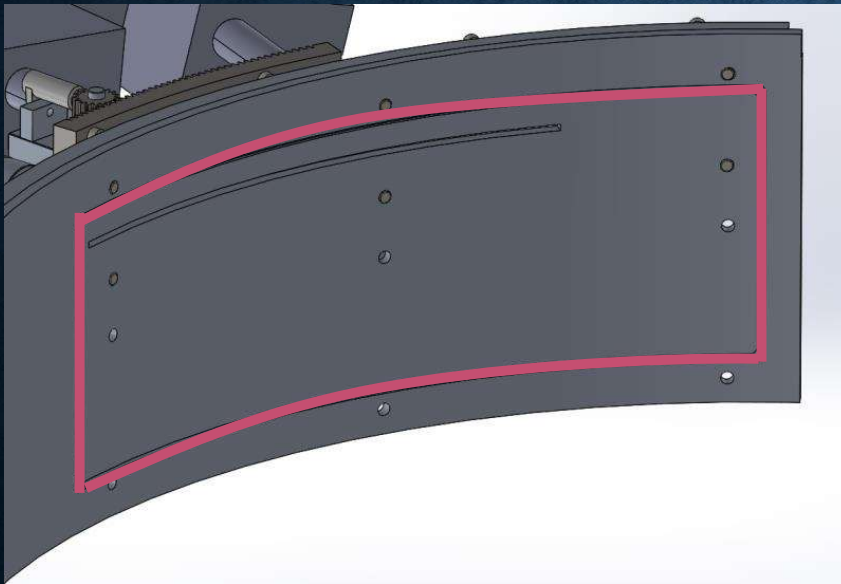
4*Static O ring



2*Dynamic O ring

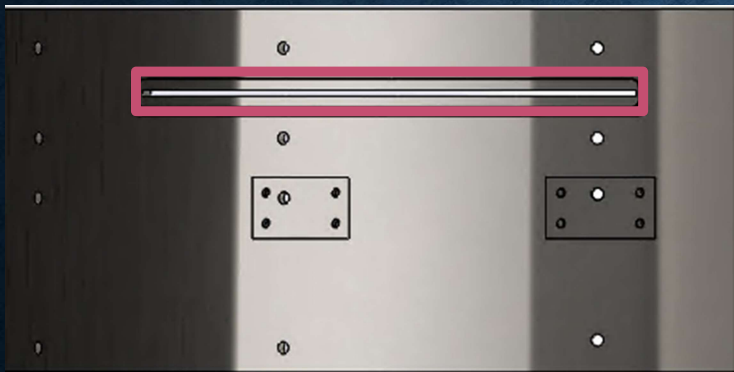


SEALING ----- O-RING BETWEEN EACH CONTACT SURFACE



Groove for the static O-ring between base and wind tunnel Groove for the dynamic O-ring between base and carrier

SEALING ----- O-RING BETWEEN EACH CONTACT SURFACE

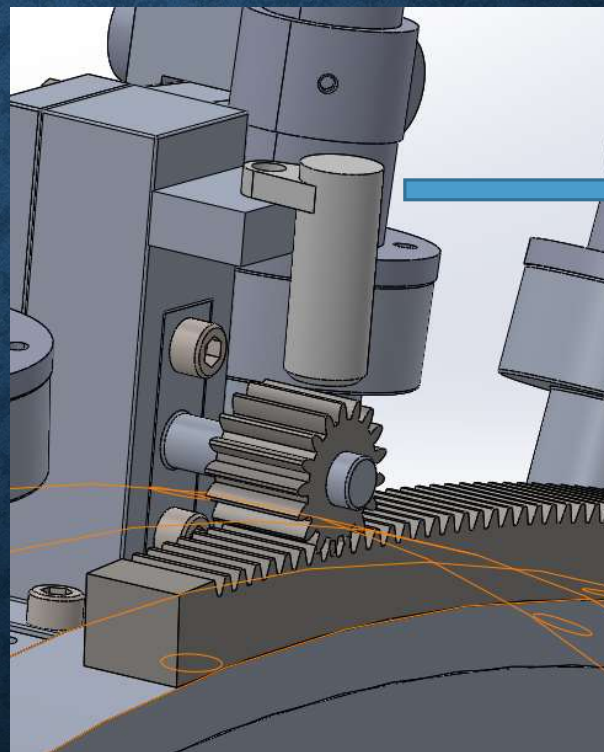
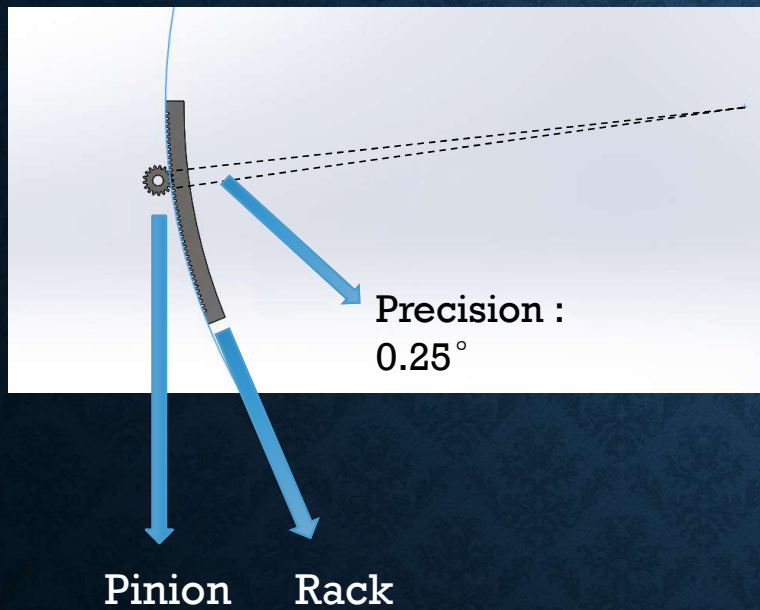


Groove for the static O-ring between base and rail



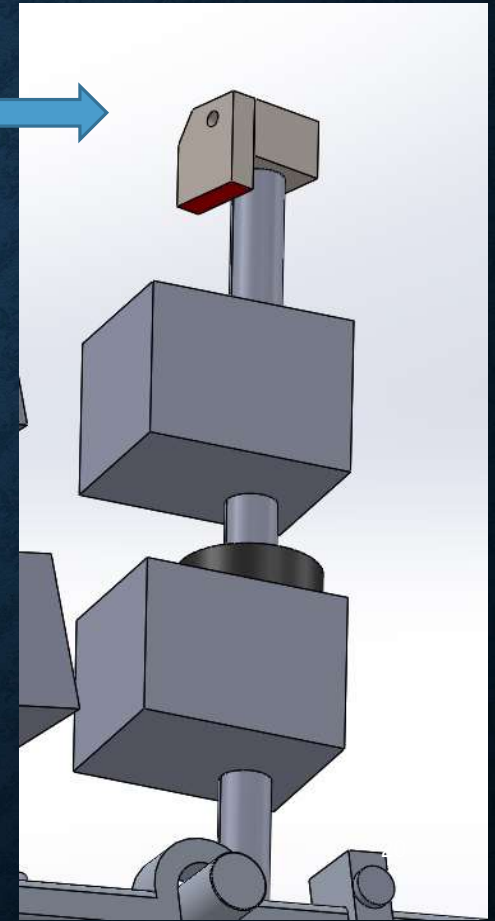
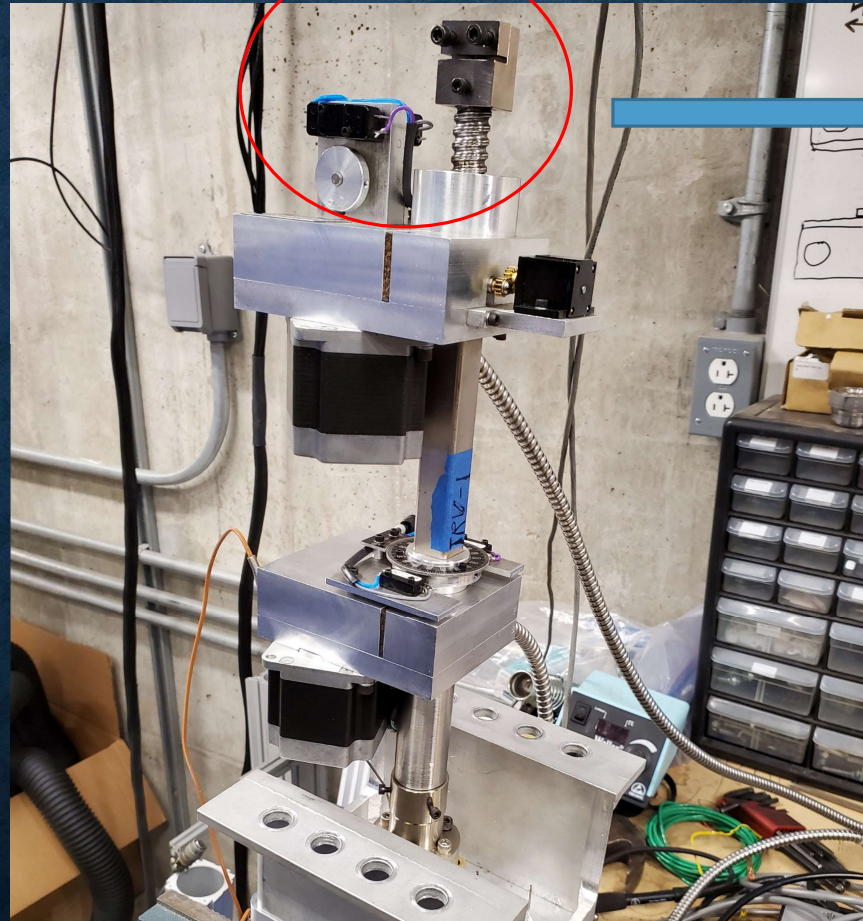
Groove for the static O-ring between rail and lid

MEASUREMENT: ANNULAR DISPLACEMENT DETECTION



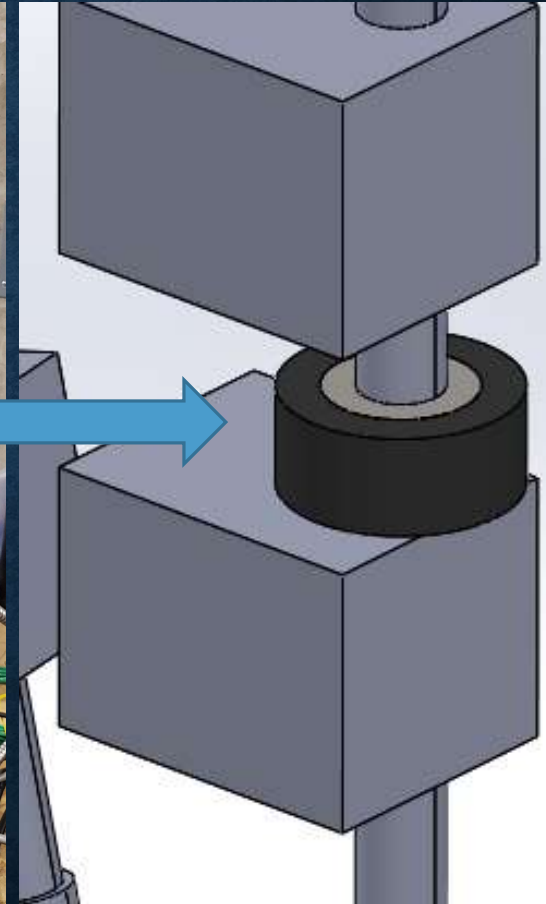
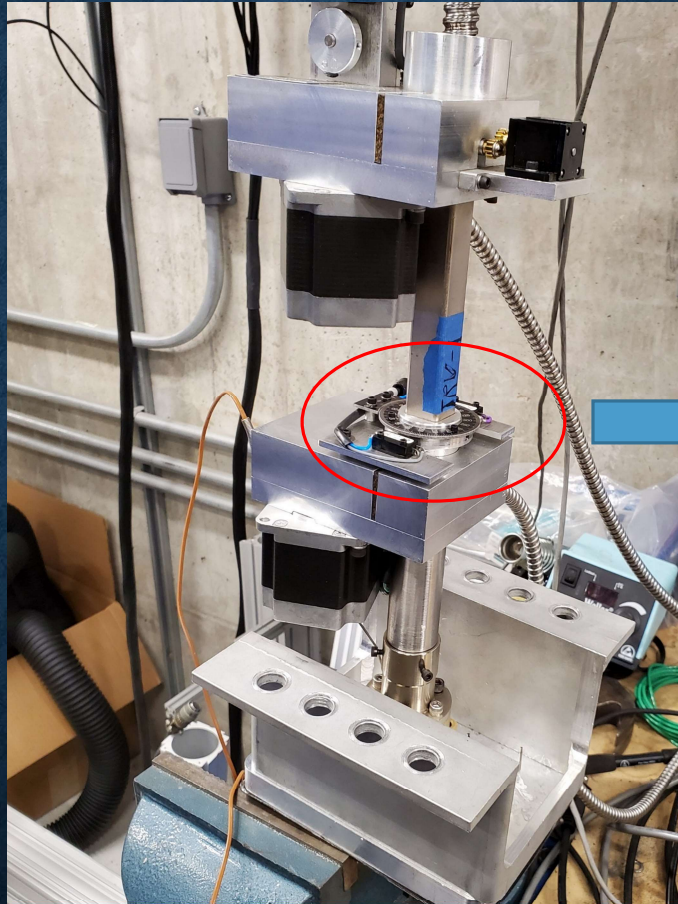
MEASUREMENT: PROBE DEPTH DETECTION

Resolution 10-400 μm
Linearity error $\pm 50 \mu\text{m}$

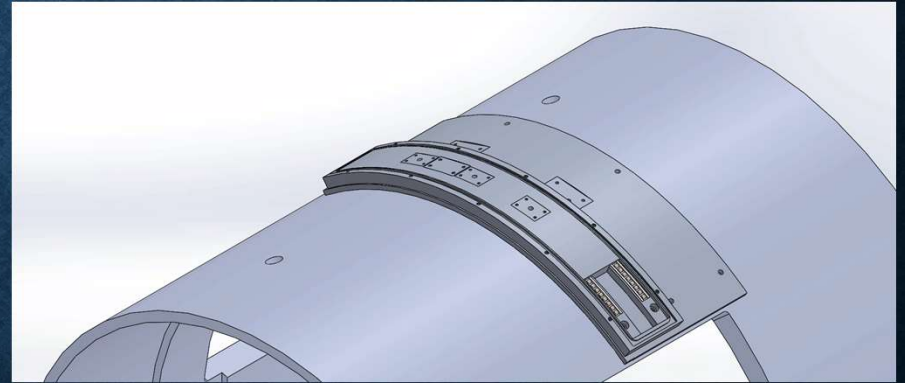
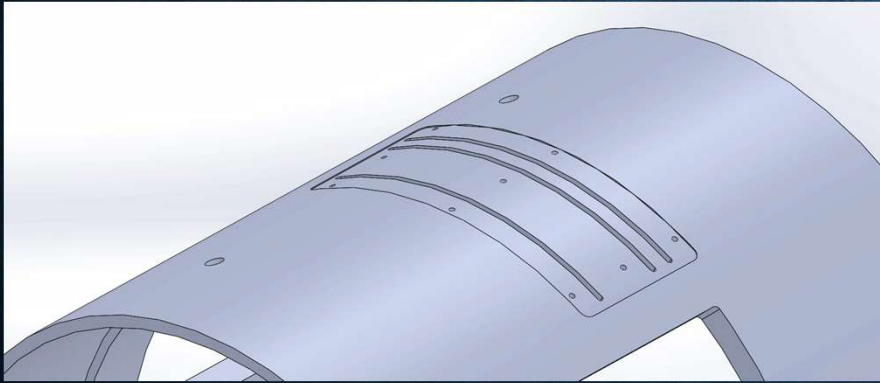


MEASUREMENT: PROBE ANGLE POSITION

Resolution 0.022°

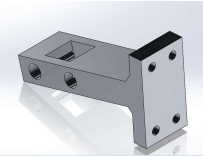

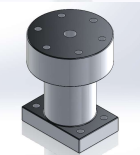



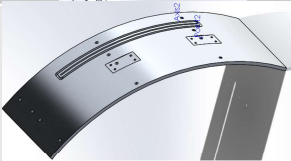

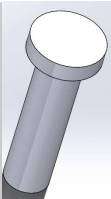
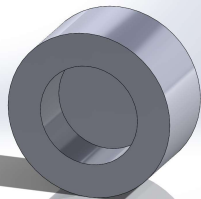


OVERVIEW OF ASSEMBLY





Business Plan

Part		Manufacture method
StandingBar_Left		Milling
StandingBar_Right		
Shaft		Milling and grinding
Round base		Turing and milling
Rail		Milling + grinding
Lid		Milling + grinding
Handle_part 1,2,3		Milling
Base		Milling+ grinding
Carrier	  	Milling + grinding
Roller		Turning
Cap		Turning

BUDGET AND PRODUCT PRICING

- Manufacturing cost: \$27,761.78
- Engineers salary: \$17600 ($5 \text{ people} * 64 \text{ hrs} * 55\$/\text{hr}$)
- Product Price: \$50,000(Price varies depending on specific design)
- Price from other company: \$400,000(?)

FUTURE BUSINESS PLAN

- What we provide:
 - High-accuracy data acquisition system design
 - Airtight measurement solutions for different types of wind tunnels
 - Automated production line traversing system
 - Customized solutions for any traversing-related scenario
- Target customer:
 - Aircraft engine companies: Rolls-Royce, GE, etc.
 - Research institutions requiring data acquisition in wind tunnel: Zucrow lab
 - Factories setting up assembly equipment



THANK YOU

Team steam