FAMU-FSU College of Engineering

Virtual Design Review 1
Team 505

Danfoss Stepper Motor Lifecycle Fixture

10/17/2024

Team Introductions

Bradford Andrews
Mechatronics Engineer

Presenter

Albert Auer
Mechanical Design Engineer

Chaney Bushman
Manufacturing and Test Engineer

Presenter

Joseph Garvie
Systems Engineer

Mason Herbet
CAD Designer

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Sponsor and Advisors

Sponsor
Cole Gray
Senior Mechanical Design Engineer

Academic Advisor
Patrick Hollis, Ph.D.
Associate Professor & Undergraduate Coordinator

Academic Advisor
Shayne McConomy, Ph.D.
Senior Design Professor

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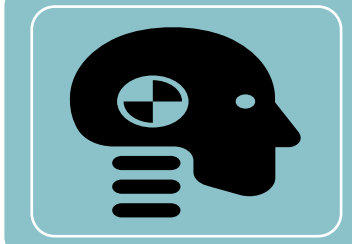
Objective

The objective of this project is to design and produce a stepper motor lifecycle test fixture for Danfoss Turbocor to improve user-friendliness and reliability over their current testing procedure.

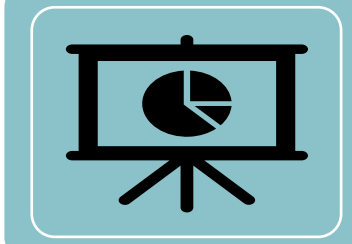
Chaney
Bushman

Project Brief

Problem:



The current stepper motor lifecycle test is conducted in the inlet guide vane assembly of the compressor



This adds undesirable friction forces, leading to inaccurate results for the motor's lifecycle

Failure between individual stepper motors have high variance

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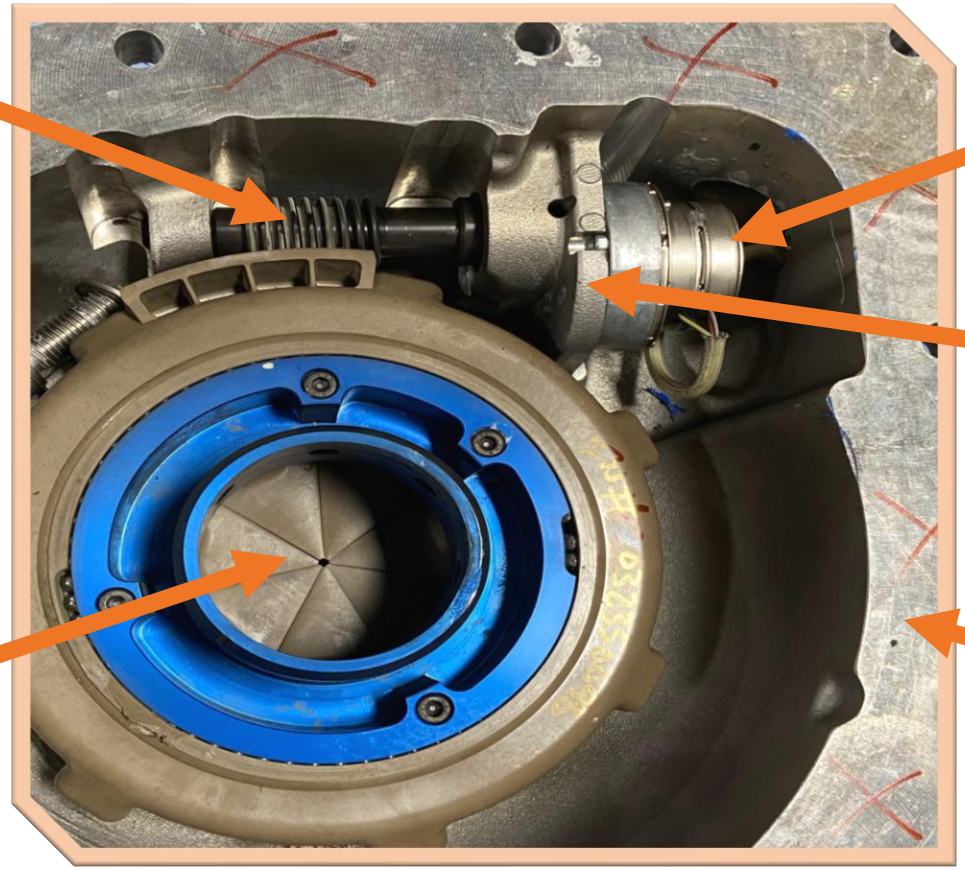
Background

Compressor Interior



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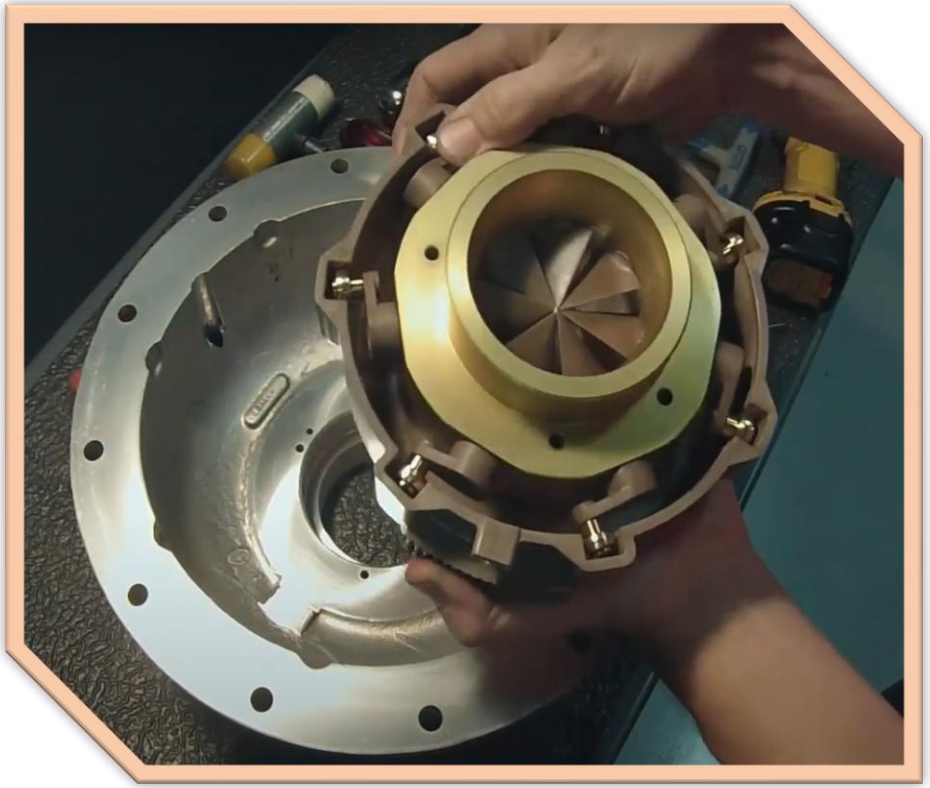
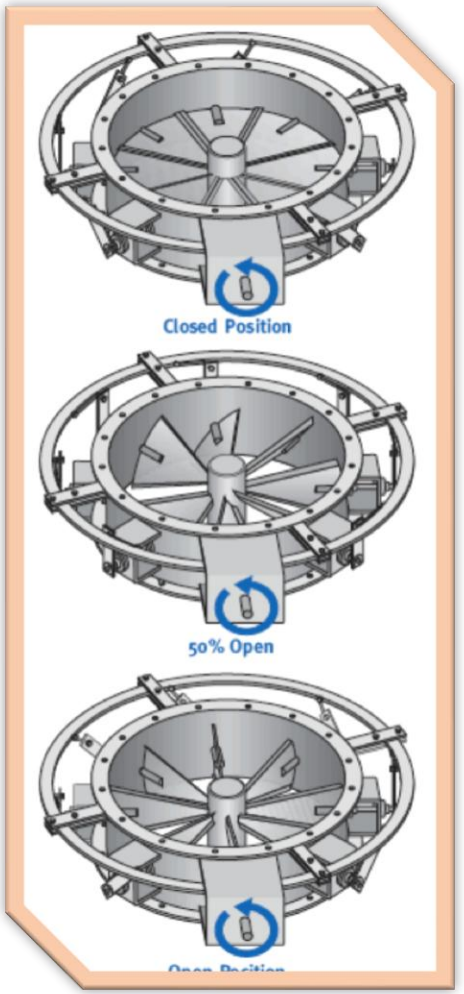
Background

Inlet Guide Vane



Controls the fluid flow at the intake of the compressor



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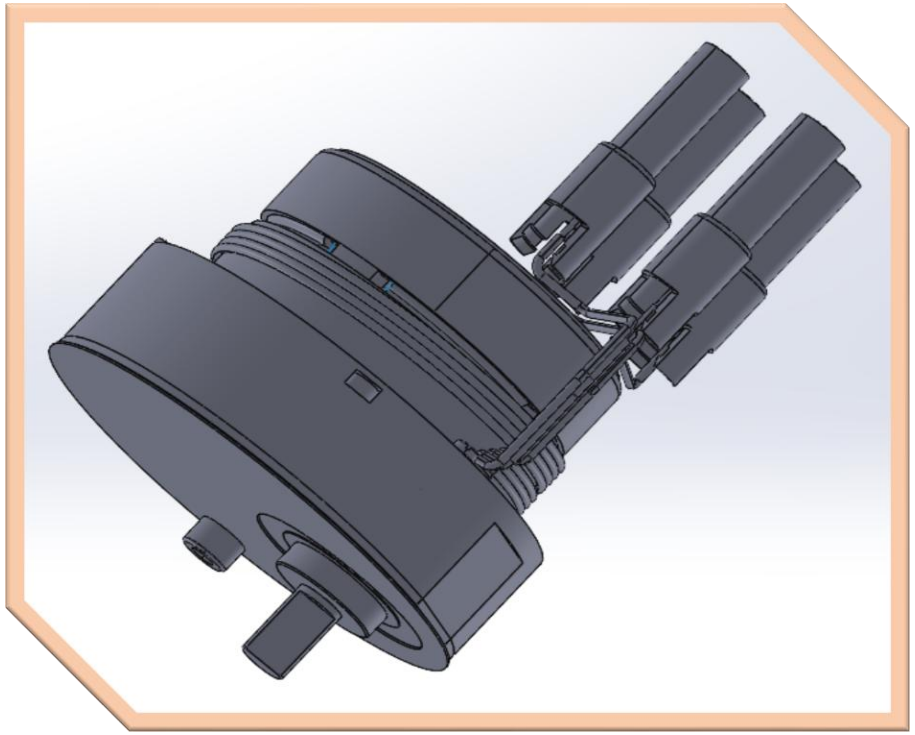
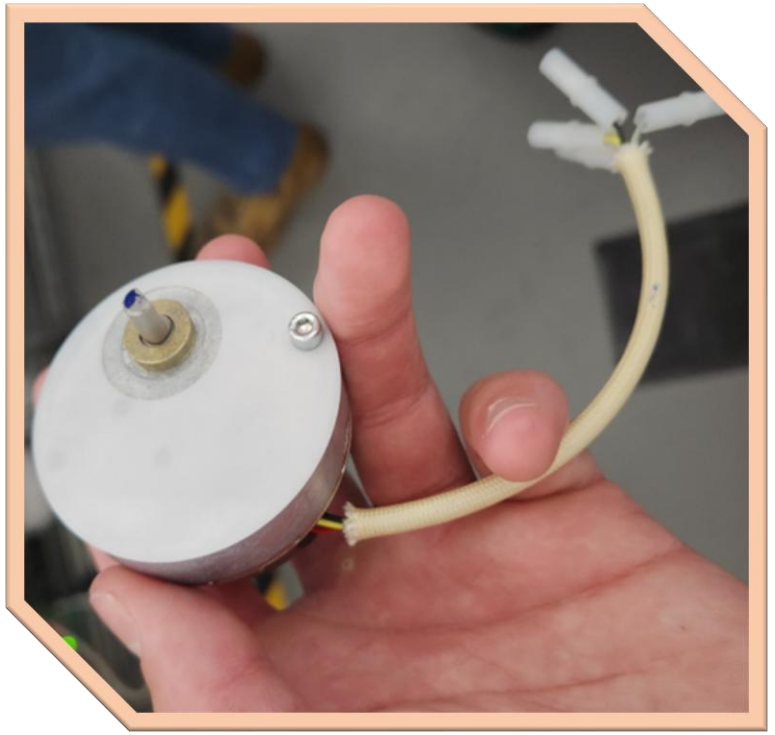
Background

910098 Stepper Motor



Control the angle at which IGV blades are positioned



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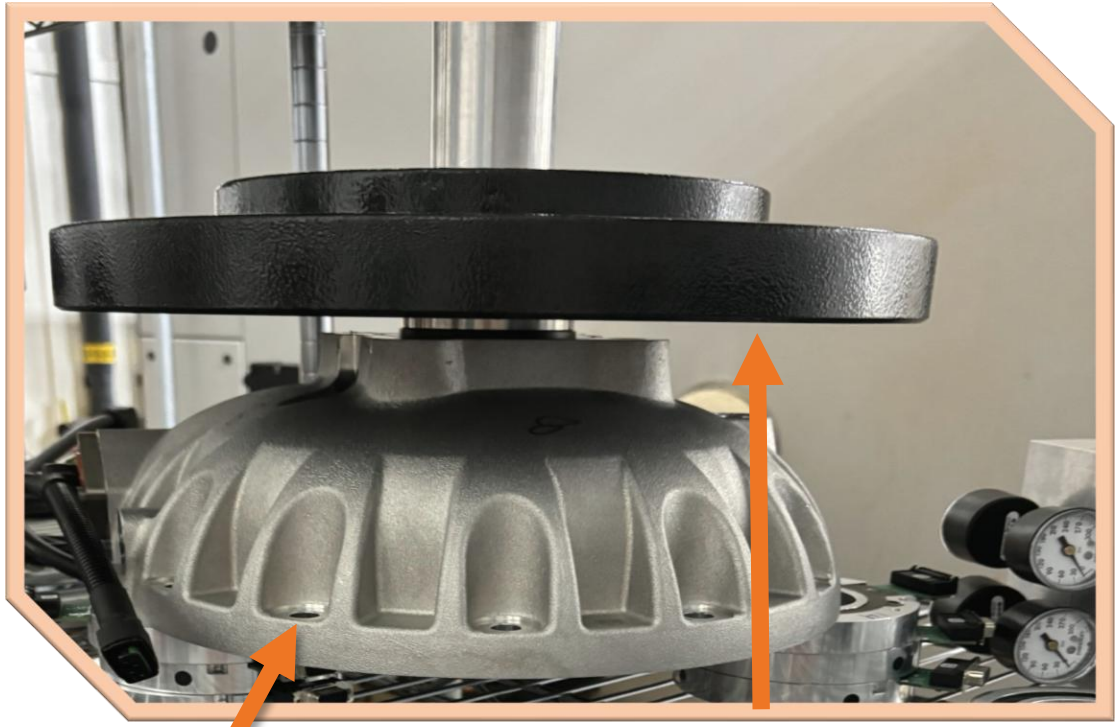
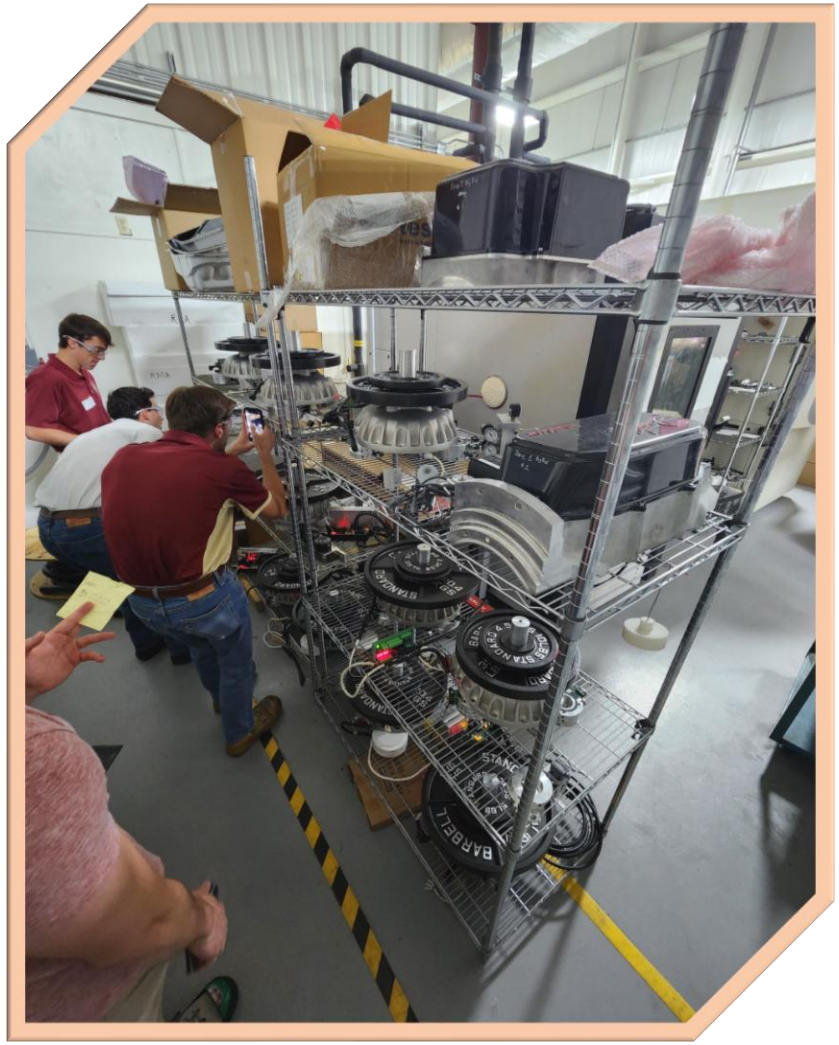
Current Test Procedure



IGV Housing

Various Weight Plates



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Primary Market

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Secondary Market

Compressor Manufacturing Companies

Atlas Copco

SULLAIR

Stepper Motor Manufacturing Companies

Oriental motor

KOLLMORGEN
Because Motion Matters™

3D Printer Companies

Bambu Lab

Laboratories (Academic)

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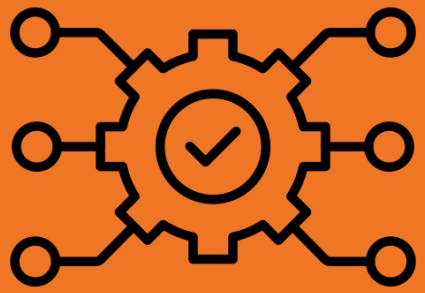
Key Goals

User-Friendliness

Reliability



Automation

Accuracy

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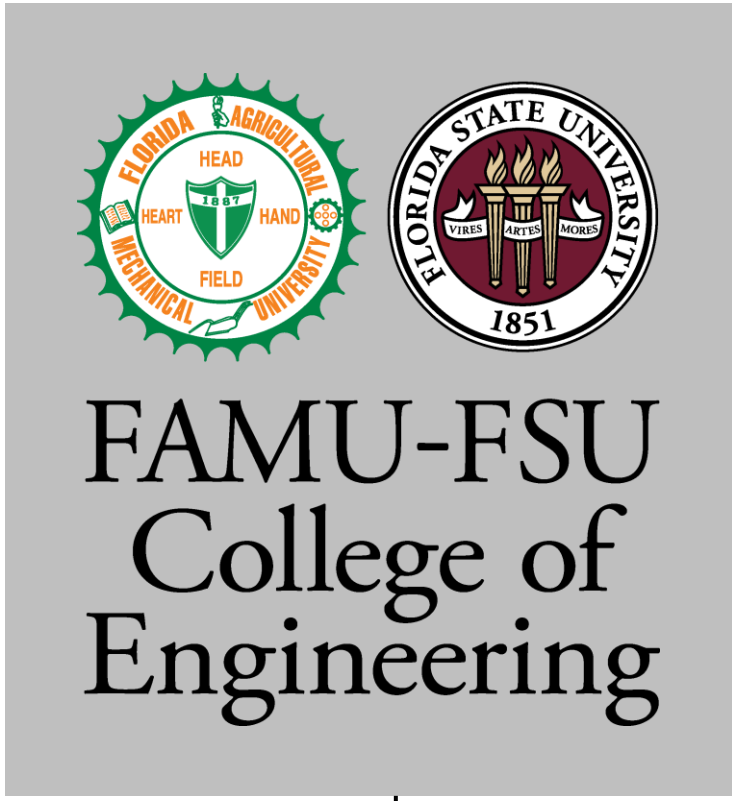
Stakeholders

Cole Gray



Dr. Shayne McConomy

Dr. Patrick Hollis

Chaney
Bushman

Assumptions

The stepper motor lifecycle fixture will be in the back room of the Danfoss factory with standard room temperature and conditions.

The fixture will sit on an elevated flat working space.

A standard 120V outlet will be available.

Only the IGV stepper motor will be tested.

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Customer Needs

- Motor oriented vertically pointing downwards
- Fabricated from non-corrosive, non-magnetic materials
- Independently run six motors at a time
- Allow for manual adjustment of Perma-Tork

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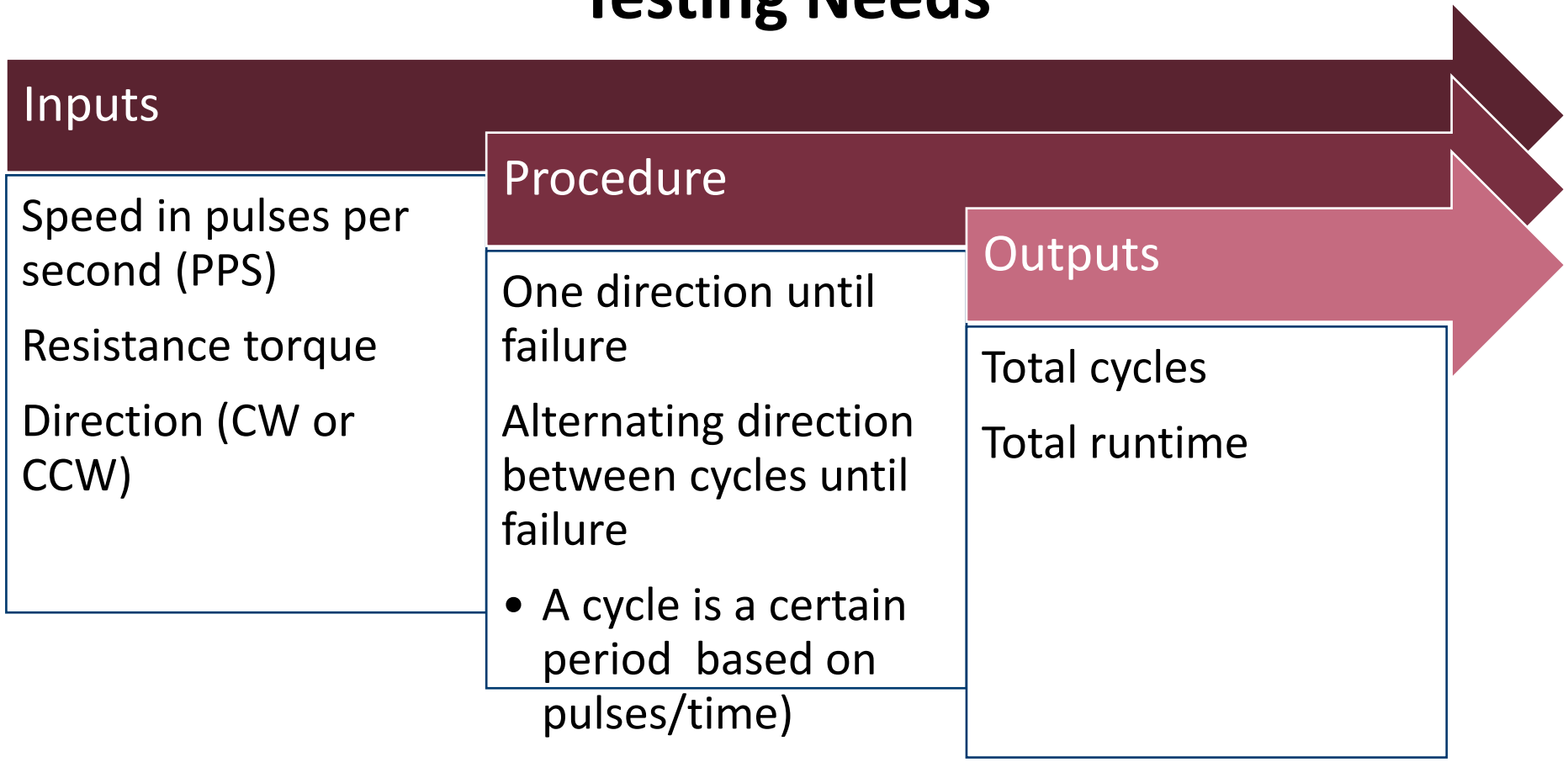
Customer Needs

Testing Needs



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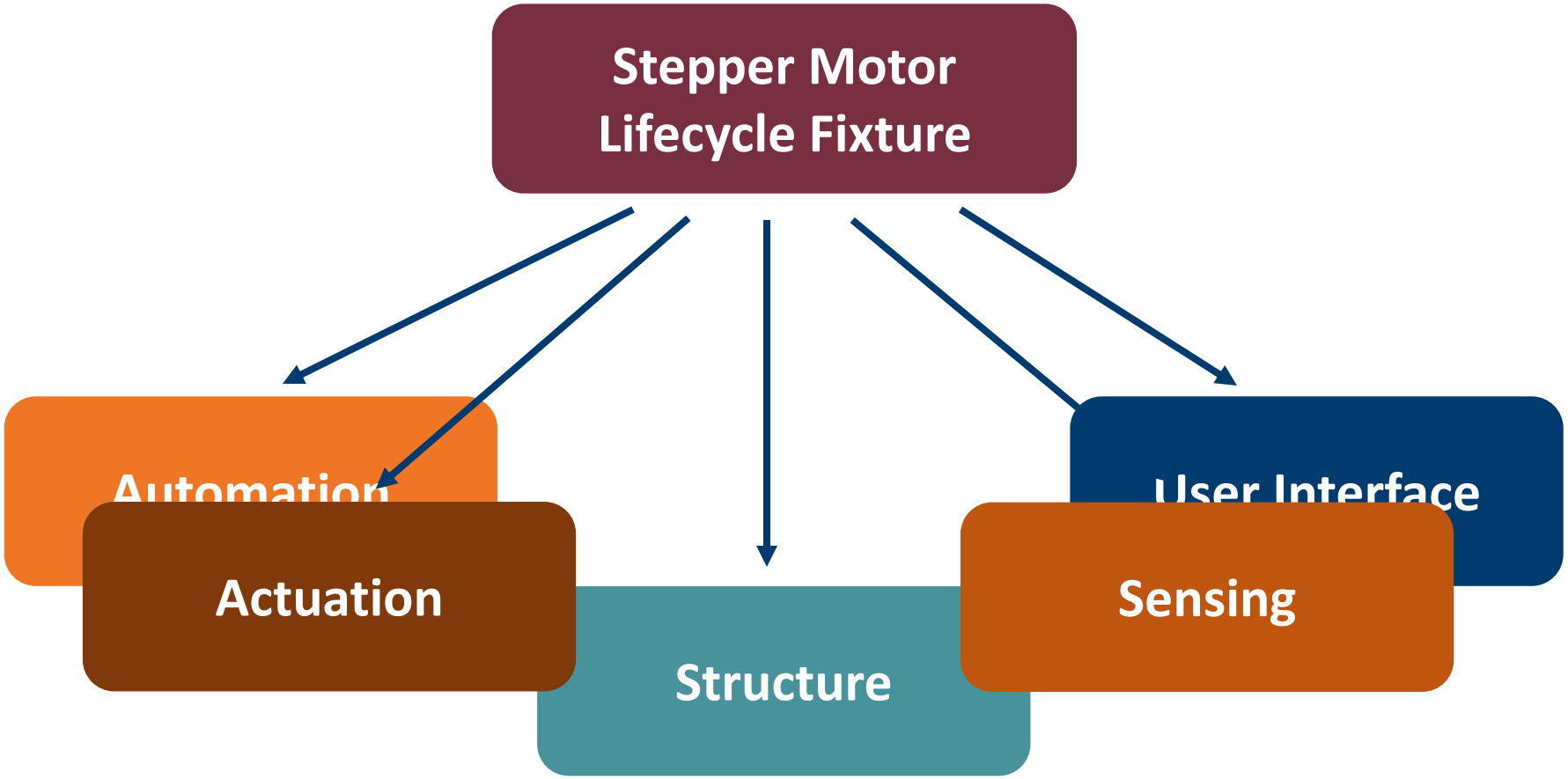
Functional Decomposition



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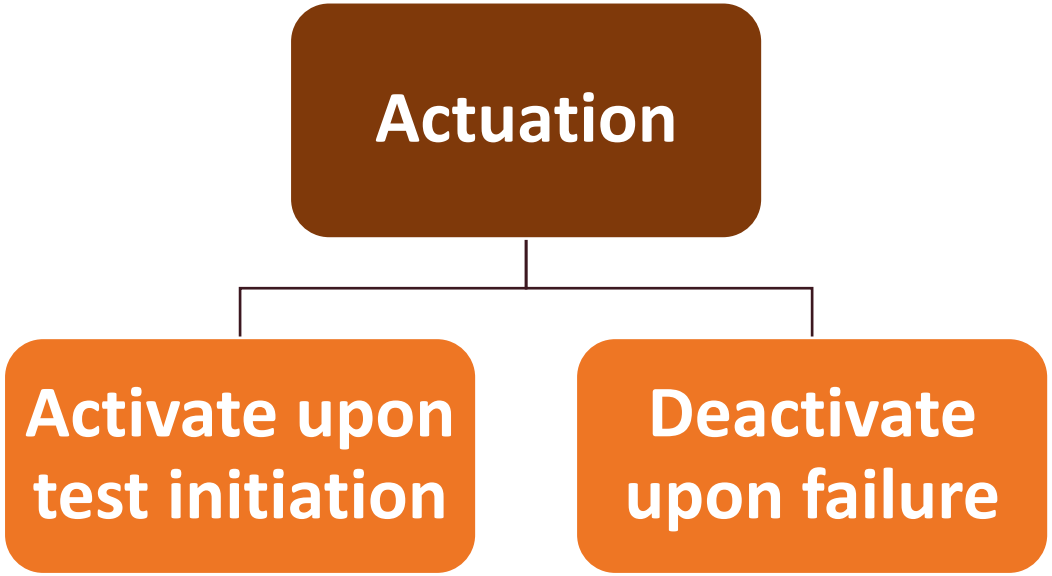
Actuation Sub-System

Danfoss Motor Driver



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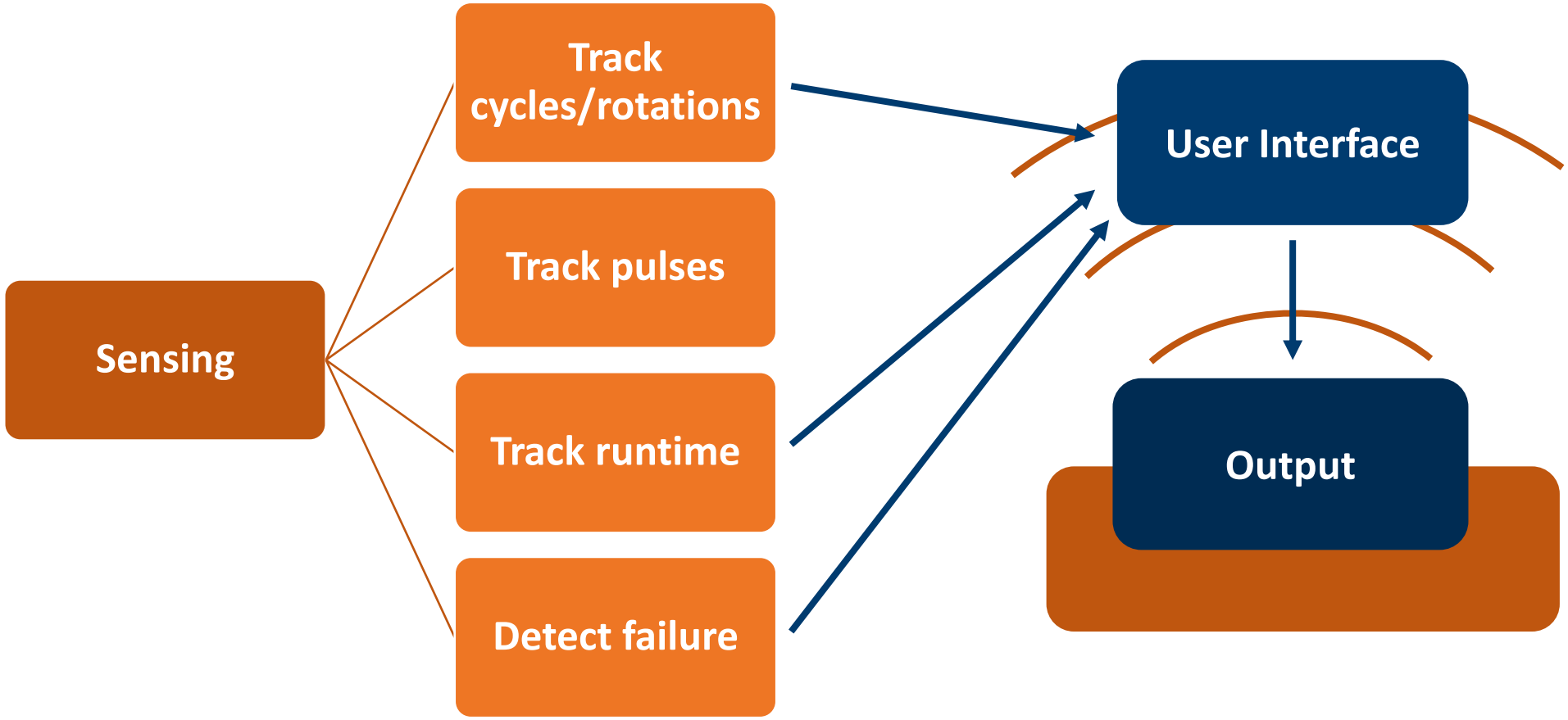
Sensing Sub-System



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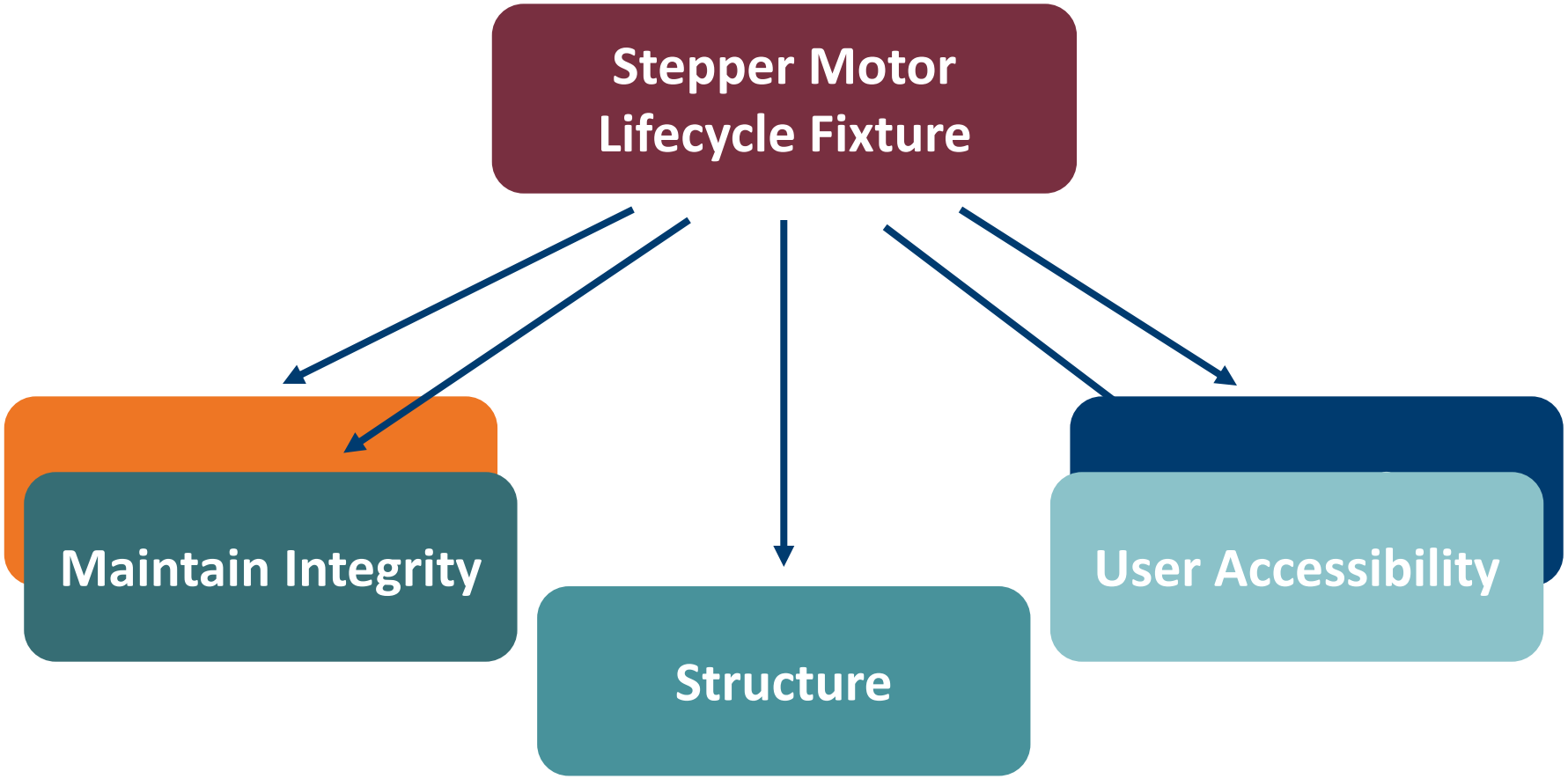
Functional Decomposition



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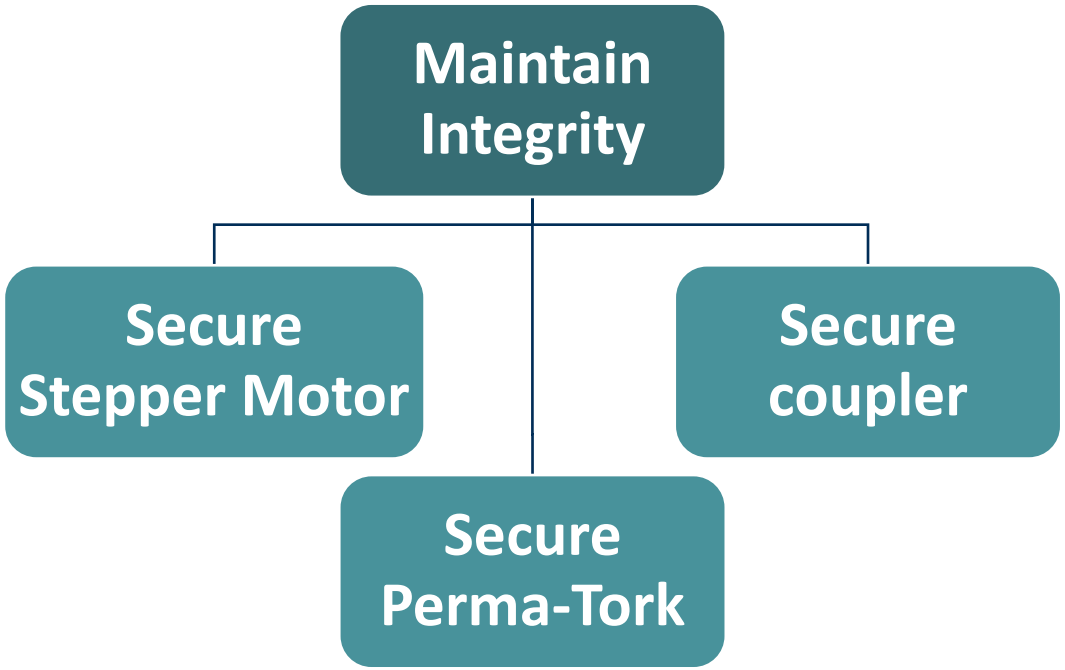
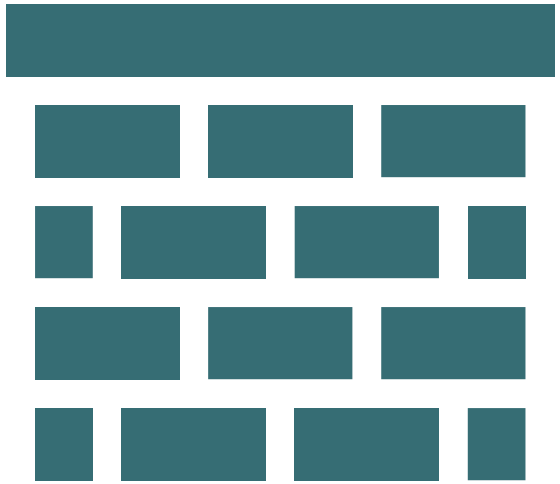
Maintain Integrity Sub-System





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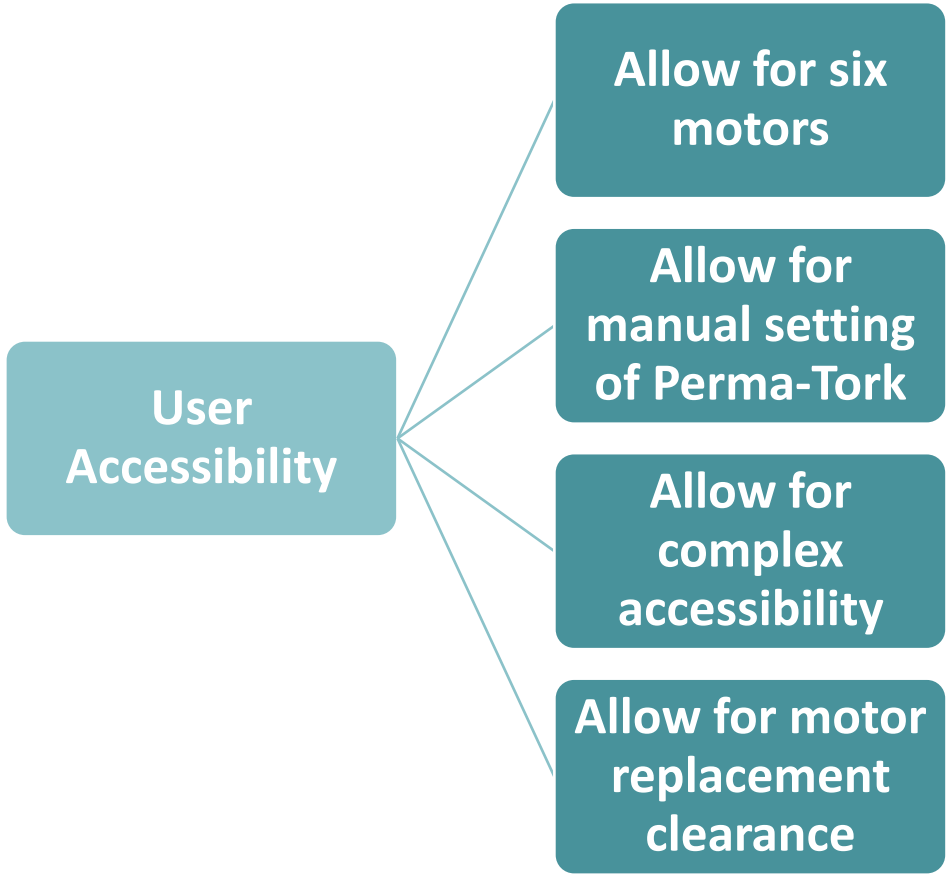
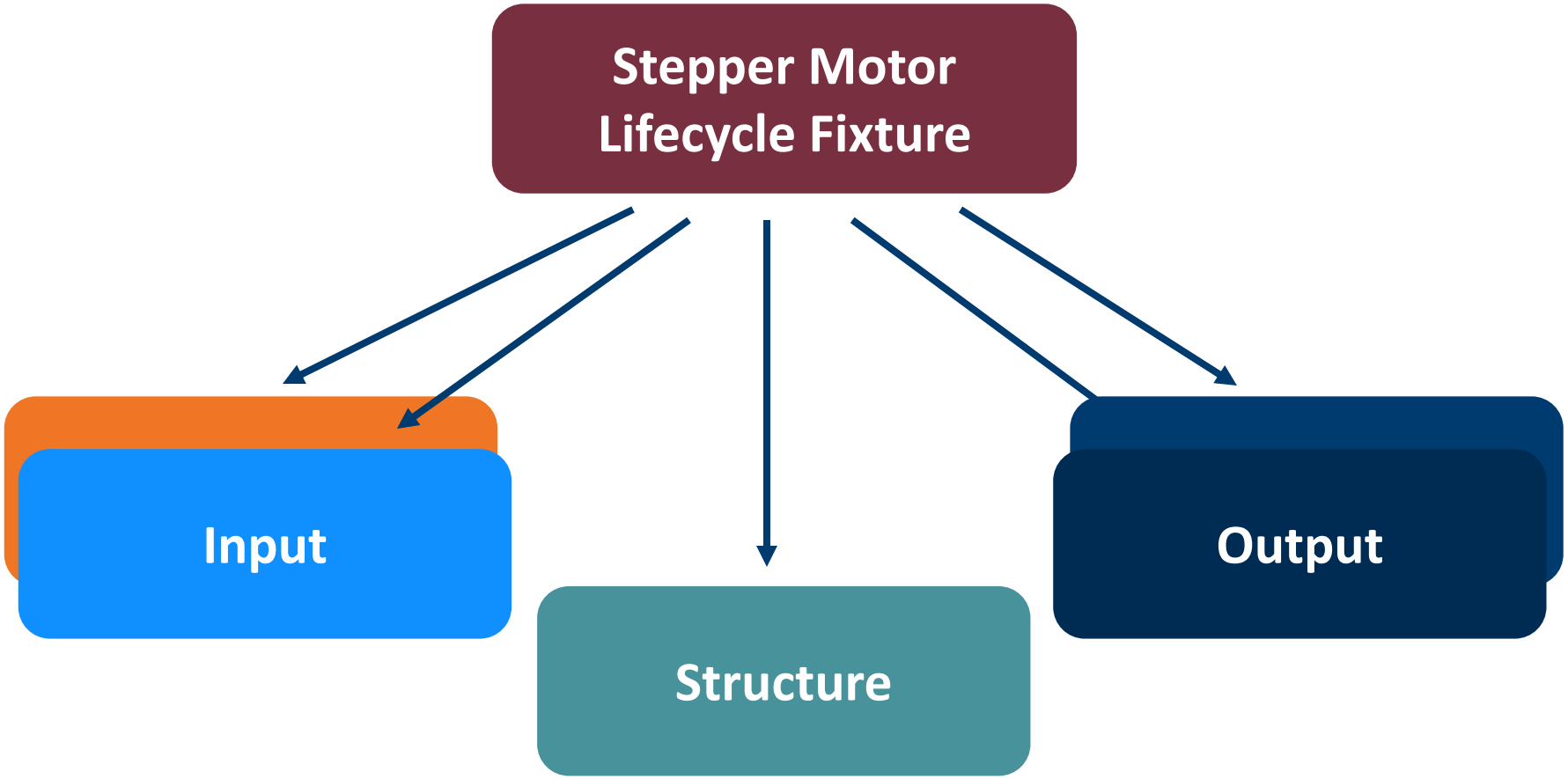
User Accessibility Sub-System



Functional Decomposition



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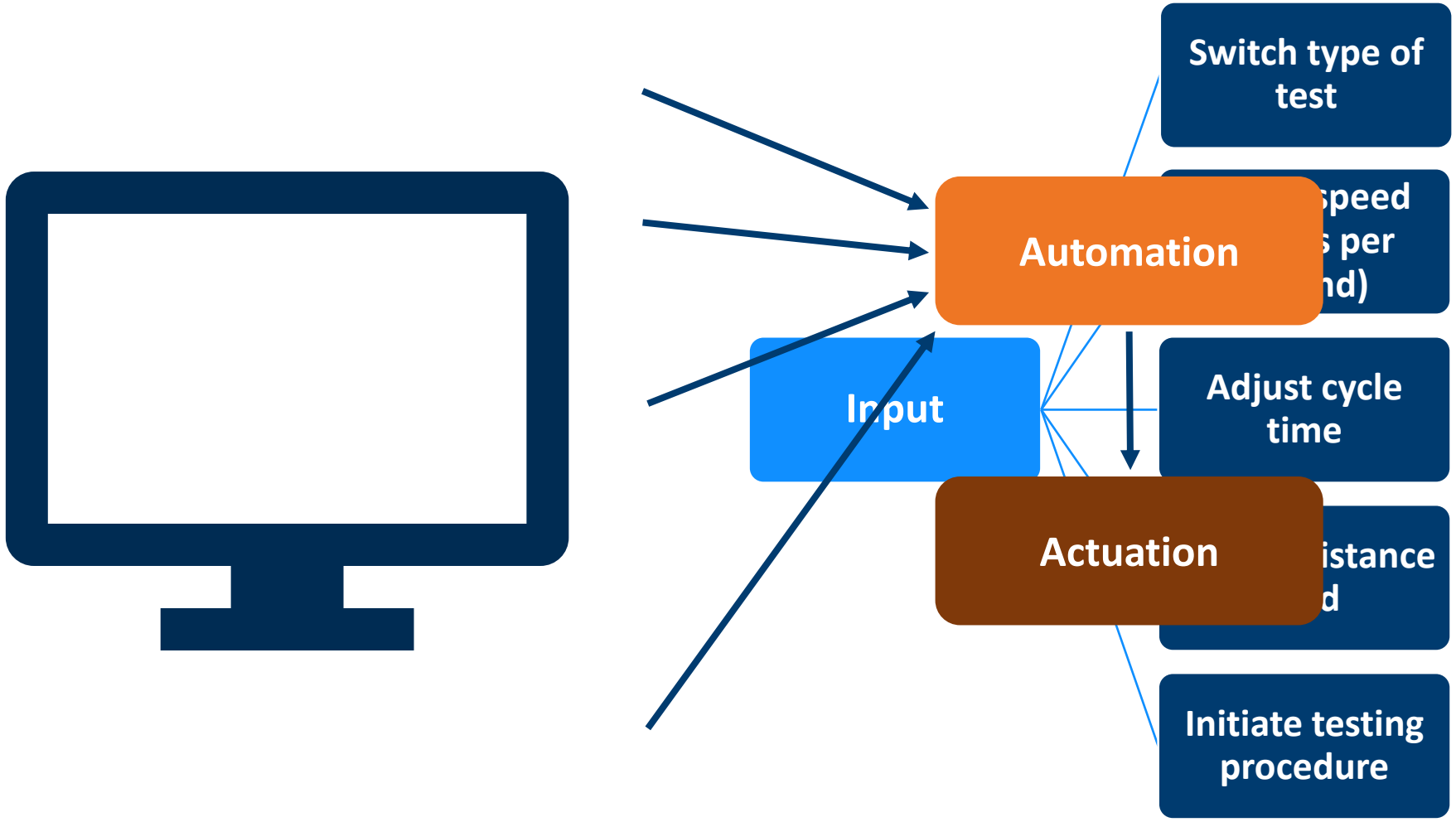
Input Sub-System



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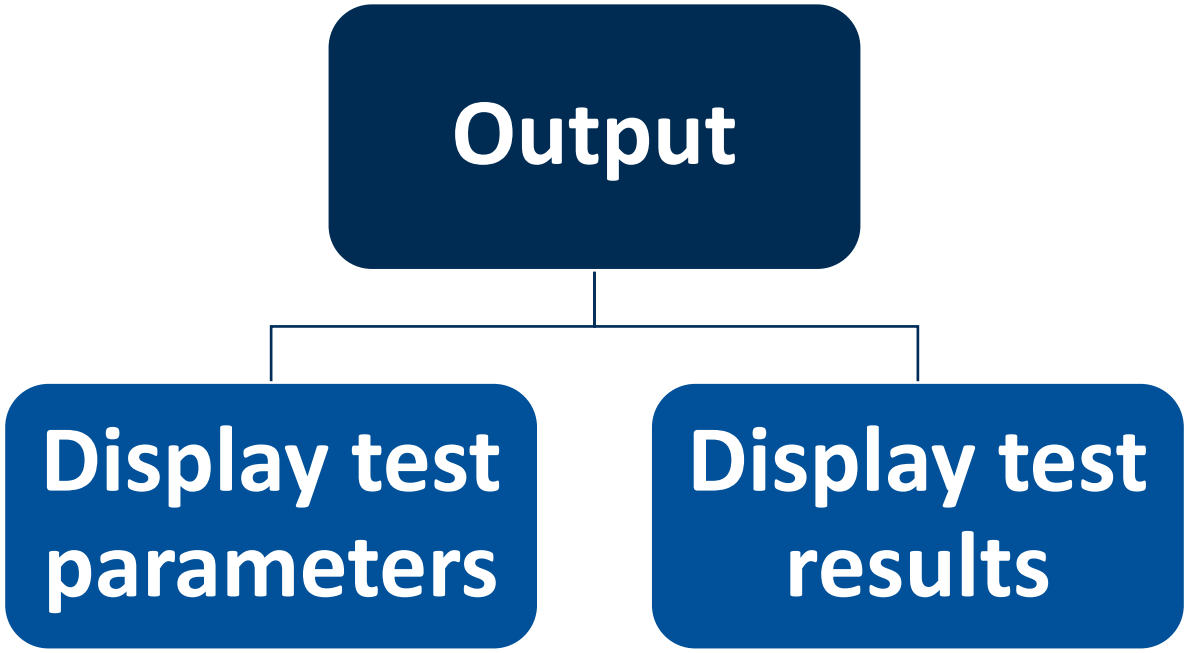
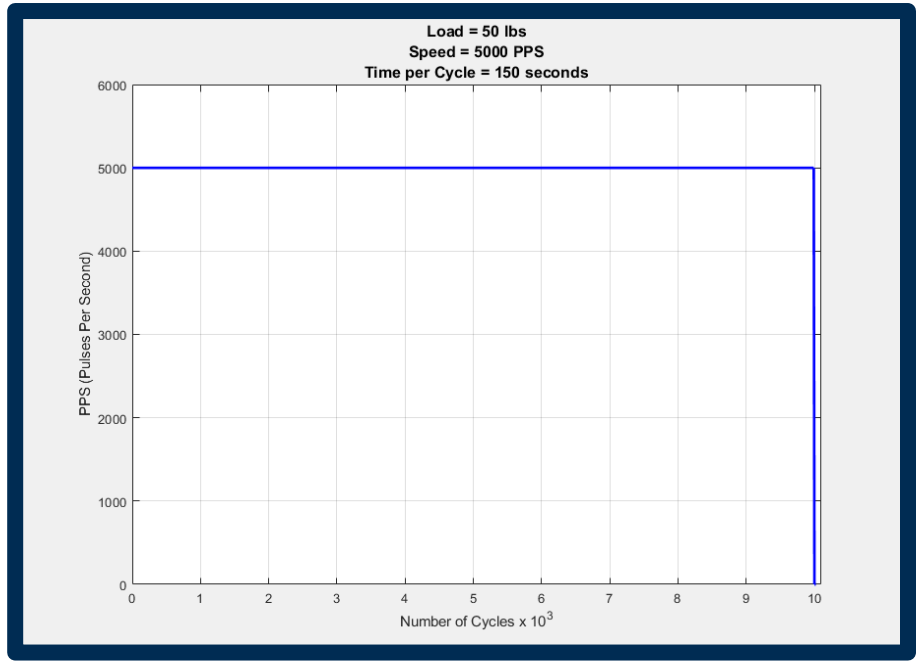
Output Sub-System





Possible Test Output

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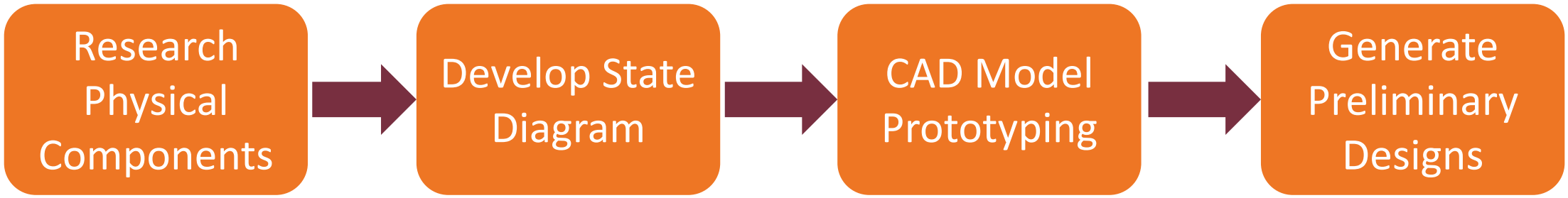
Future Work


Research Physical Components
Develop State Diagram
CAD Model Prototyping
Generate Preliminary Designs

Questions?

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