Lockheed Martin Low-Cost Simulator

Senior Design
Team 514

Francisco Lopez

Meet the Team

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Brandon Krick

Mechanical Engineer, Ph.D.

Associate Professor

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Project Objective

The objective of this project is to integrate a Rudder Pedal System (RPS) and Hands-On Throttle and Stick (HOTAS) to be used in the F-35 pilot training program. The F-35 simulation equipment needs to be lower in cost, easily deployable, and like in-flight feel.

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Project Background

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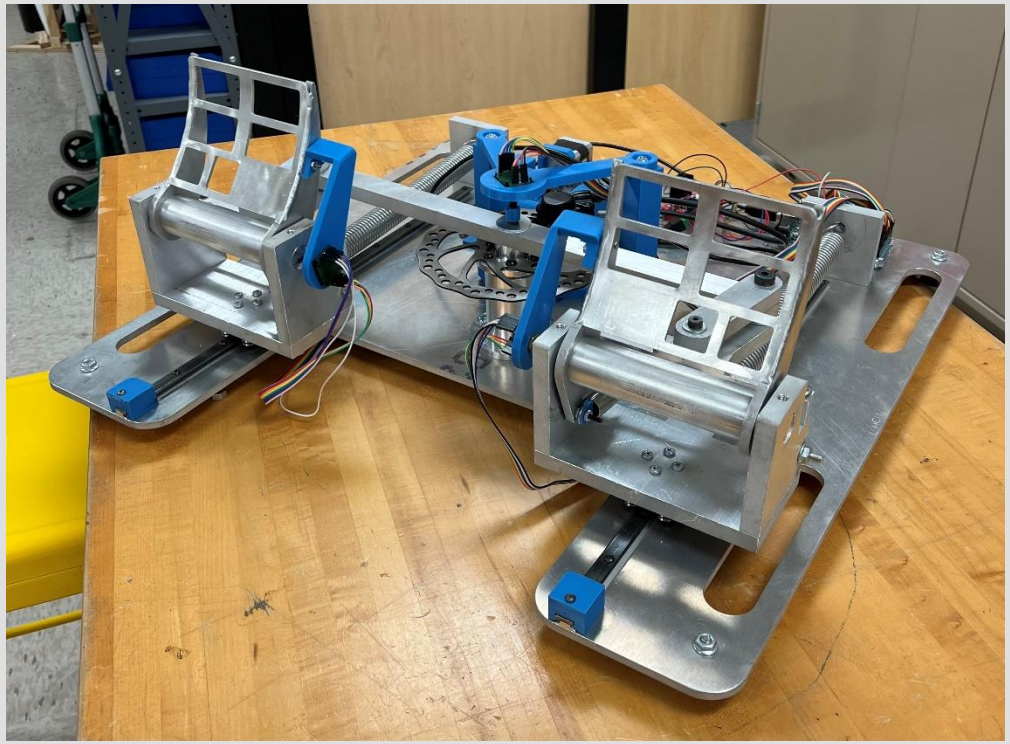
Rudder Pedal System



Credit: SD T510, 2022

- Rudder Pedal System (RPS): system that controls the rudders at the rear of an aircraft
- Rudders control the yaw rate of a plane
  - Similar to turning left or right in a car
- Current simulator rudder pedals are very robust and expensive to make

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HOTAS System

- HOTAS: Hands on Throttle and Stick
- The throttle controls the thrust to the aircraft.
- The stick controls the pitch and roll of the aircraft and is mounted on a rotary joint.

Throttle

Stick

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F-35 Training Simulation

- The simulation used by Lockheed Martin is the Prepar3D program.
- Training simulation can be run at a desktop or full-scale cockpit model.
- Training simulation should be as realistic as possible for smooth transition from simulation to in-air flight.

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Project Scope

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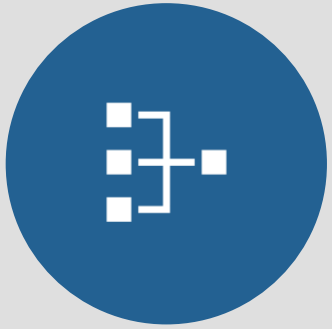
Key Goals

CREATE FINISHED, WORKING PROTOTYPE



INTEGRATE BOTH PHYSICAL SYSTEMS INTO THE SIMULATION PROGRAM

KEEP MANUFACTURING COSTS LOW

CAN BE USED IN DESKTOP OR COCKPIT TRAINING MODELS

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Assumptions

- Access to 3D printing and fully equipped machine shop
- Budget of $2000
- Access to projects from the last two years
- Administrative login credentials to the Prepar3D program
- Only designed for F-35 pilot training
- Equipment will be manufactured & mounted to withstand use

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Markets

- Primary
  - Lockheed Martin
- Secondary
  - United States Military
  - Commercial Flight Simulators
  - International Military Partners

Stakeholders

- Lockheed Martin
- FAMU-FSU College of Engineering
- Military

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Customer Needs

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Customer Needs

- Integration between the RPS and HOTAS
- Able to simulate take-off, any flight maneuvers, and landing in any flight conditions
- Each component should be less than $1000
- Compatible with both a standard desk and a 3D printed F-35 cockpit

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Functional Decomposition

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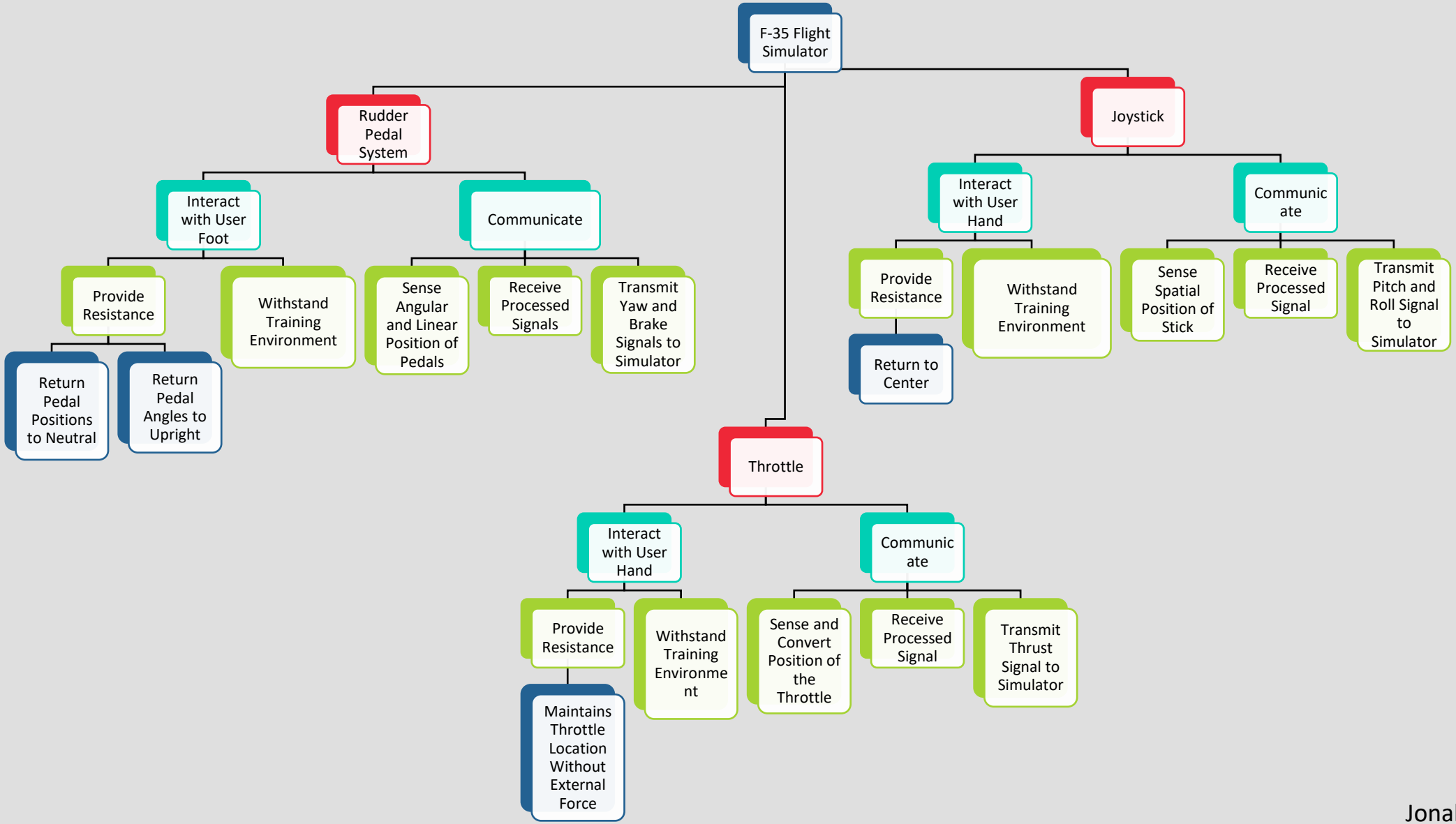

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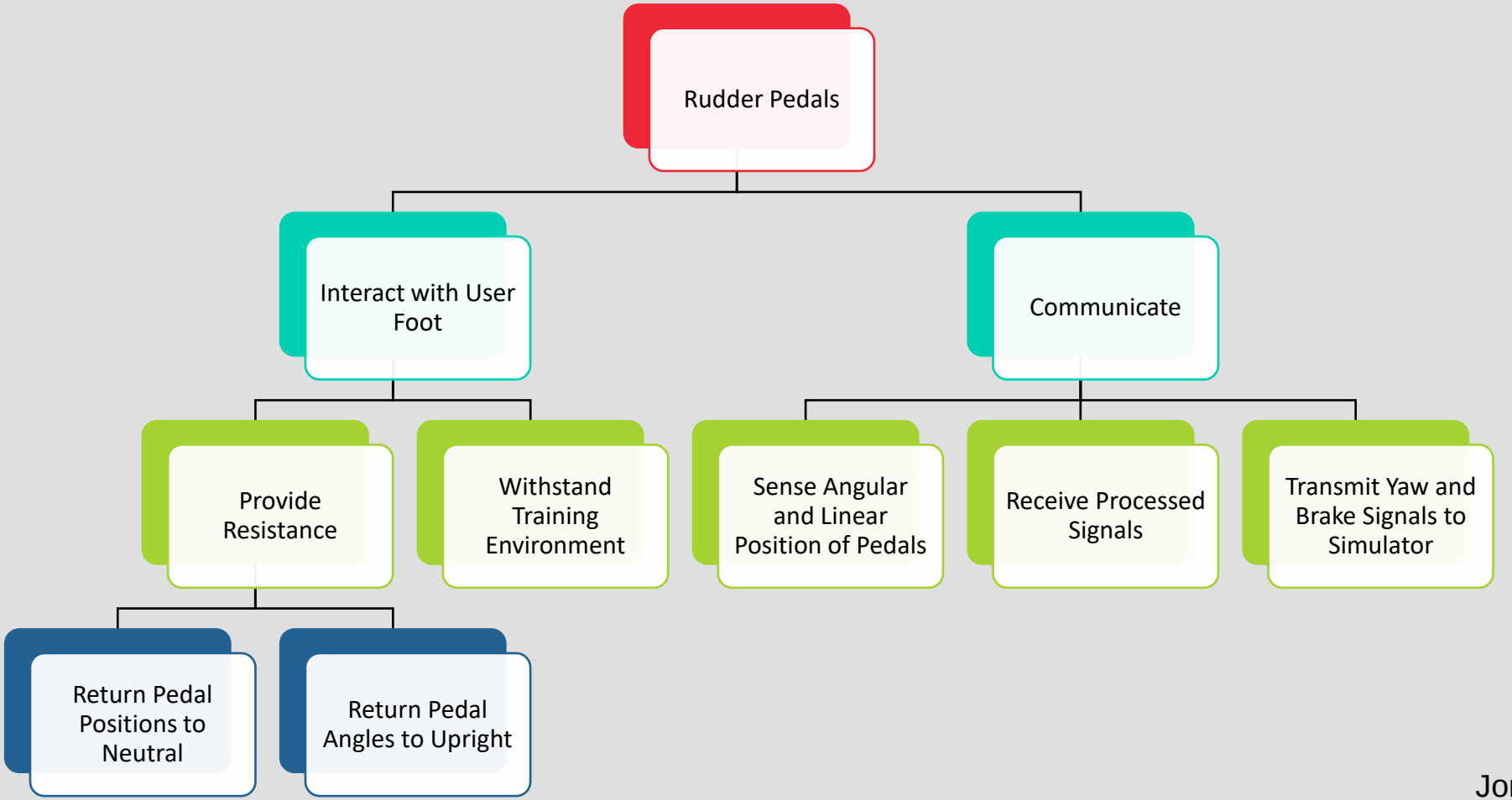
Rudder Pedal Functions



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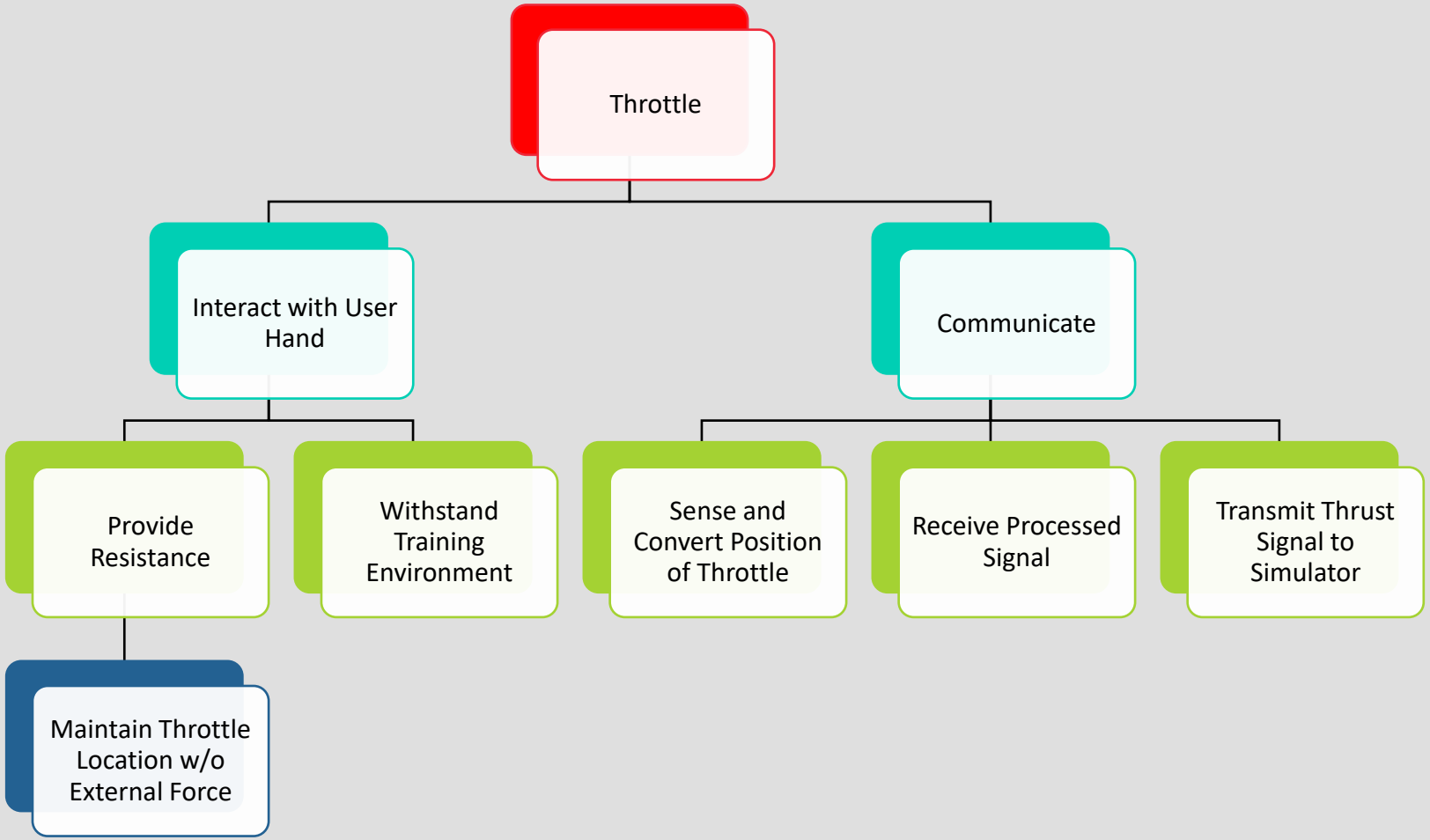
Throttle Functions



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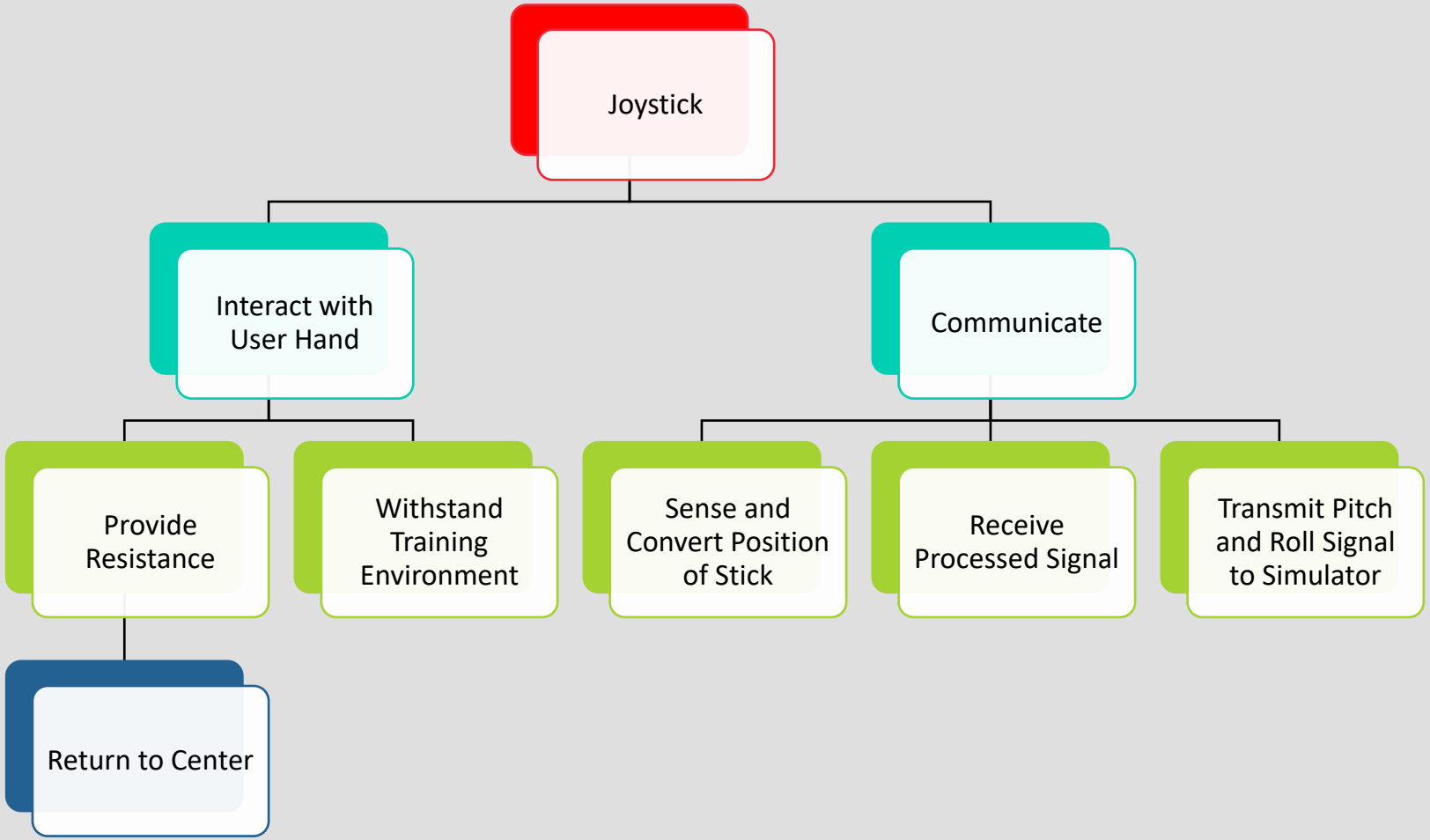
Joystick Functions



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Future Work

- Targets and metrics
- Concept generation and selection
- Mold and past models will be provided later
- Redesign new HOTAS and integrate it with the RPS
- Start creating code for the sensors and controls for the HOTAS

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Questions?

Design Team

Sponsor

Objective

Background

Scope

Customer Needs

Functional Decomposition

Future Work

Francisco Lopez

References

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