Underwater Robotic Observation Vehicle (ROV)

CDR Report

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Capstone Design II

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Project Summary:

The ROV is defined as a remotely controlled vessel that can operate to a maximum depth of 4m, with movement in two axis planes via brushless motor thrusters defined as horizontal movement with the ability to rotate within a plane as well as depth compensation vertically. A control module will be responsible for sending serial data to an onboard microcontroller that will interpret the joystick data sent from the command module. The onboard microcontroller will process commands to motors and transmit sensor data back to the command module for user information. A raspberry pi computer will process the camera and convert data to serial and transmit back in a low latency live video feed. The ROV is intended to be lightweight and for use in shallow (4m) water.

Specifications:

- Remote Control underwater vehicle with video streaming to a screen
- Wired control of directional motors in two axis from an on-land joystick
- 4-meter depth capability

Changes:

- The frame design has been upgraded to include a more robust electronics chamber consisting of a 6-inch PVC pipe rated for pressure. The 3D printed shell will be mounted to this tube.
- The number of motor thrusters has been upgraded to 4 instead of the original 3.

Technical Approach:

Project tasks

1. Finalize frame design
2. Start 3D printing all parts that are ready
3. Finalize electrical components on PCB
4. Install first prototypes
5. Reevaluate design changes
6. Install prototype changes
7. Test prototypes

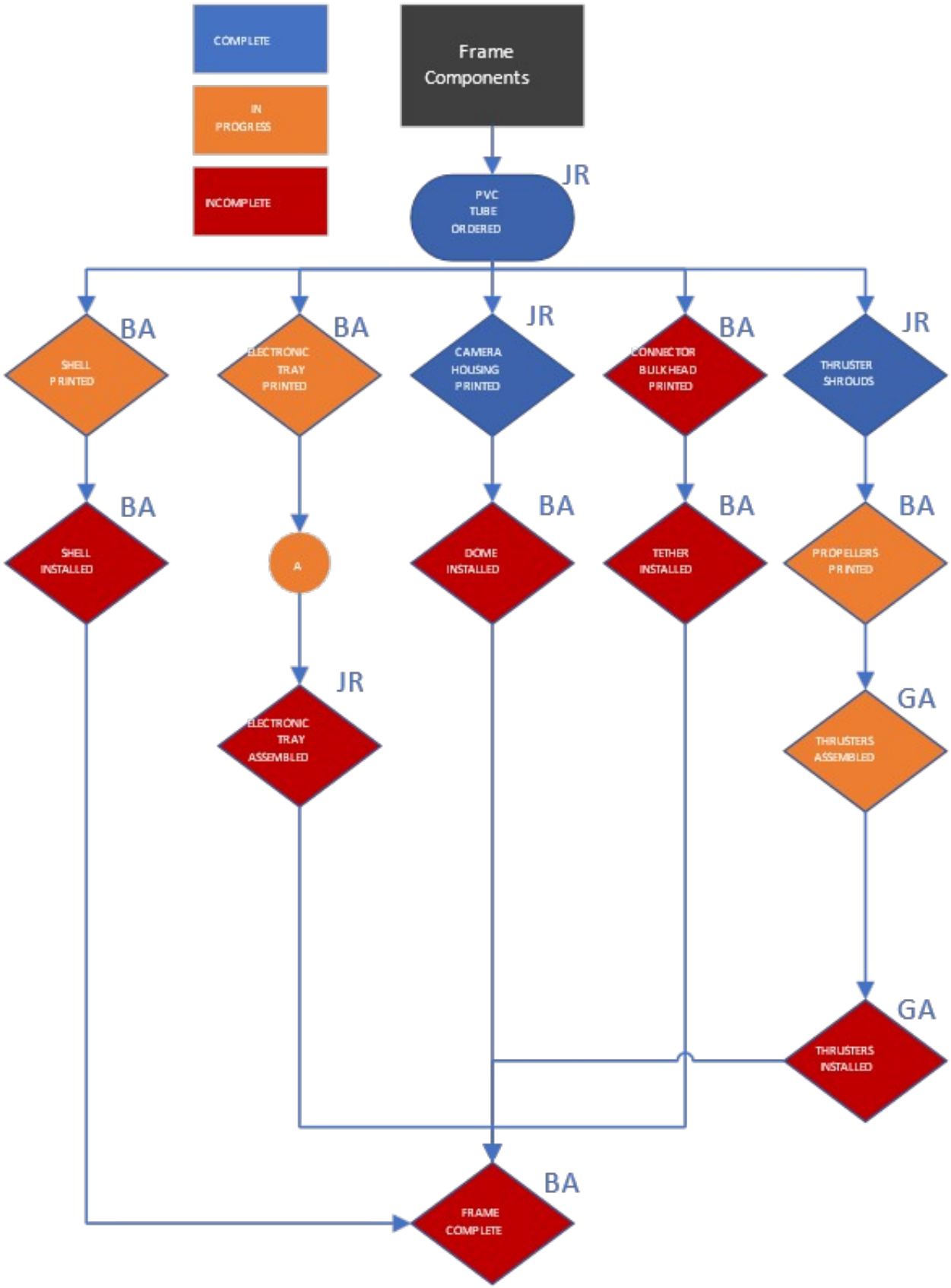
Project schedule evaluated

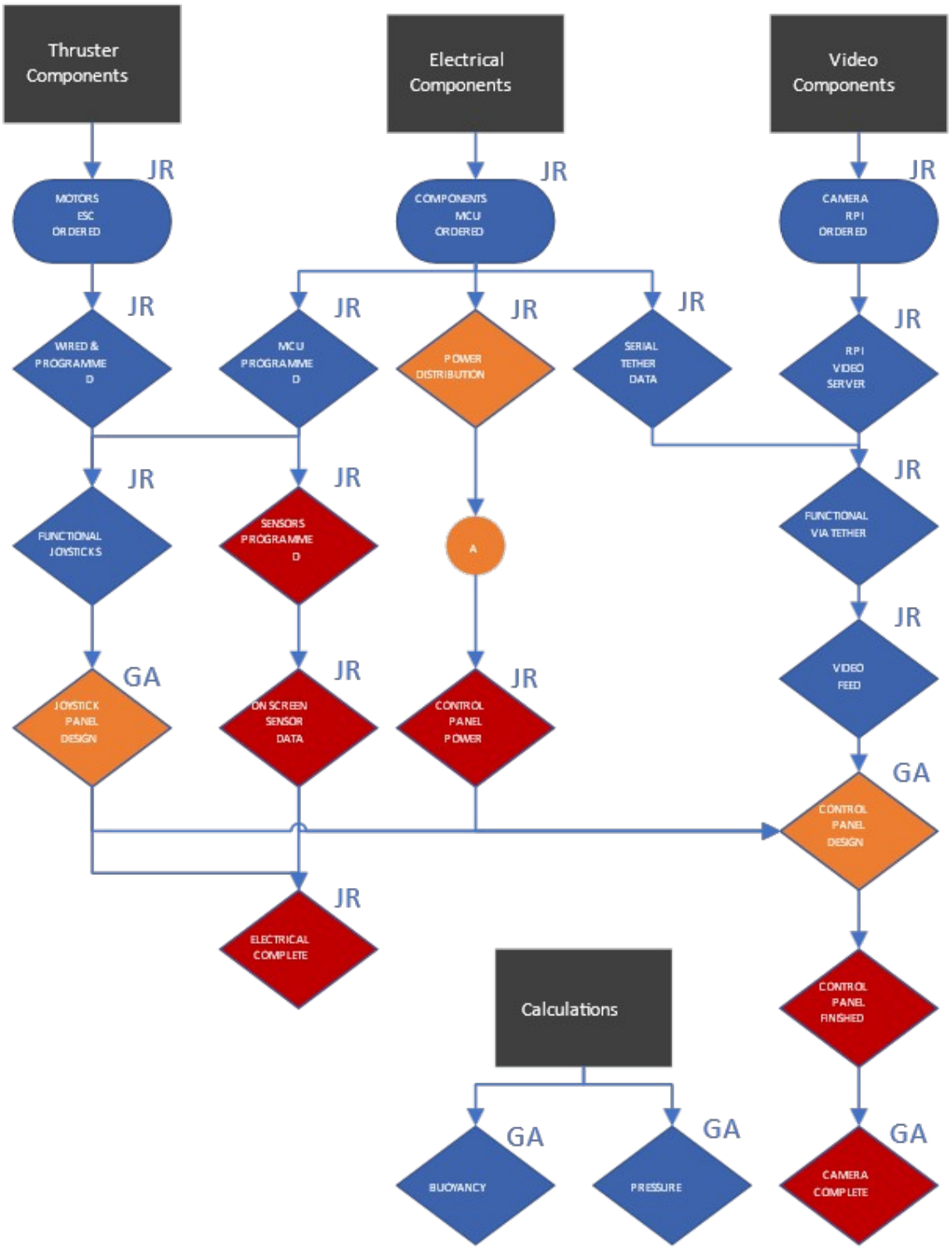
1. Formalize meeting schedule
2. Revise schedule

Capabilities

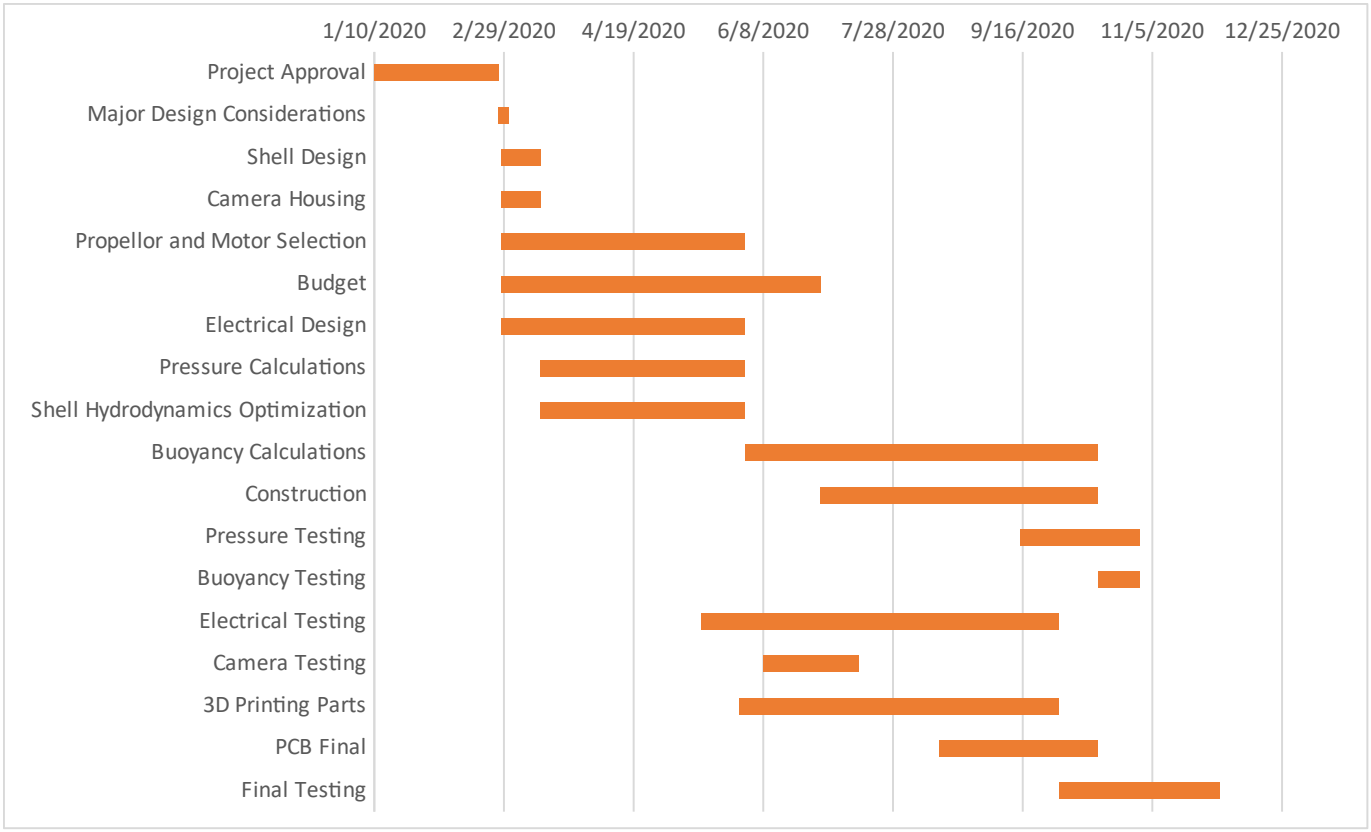
1. Assess progress based on capabilities of facilities

Flow Chart:


COMPLETE
IN PROGRESS
INCOMPLETE
Frame Components
PVC TUBE ORDERED
JR
SHELL PRINTED
BA
ELECTRONIC TRAY PRINTED
BA
CAMERA HOUSING PRINTED
JR
CONNECTOR BULKHEAD PRINTED
BA
THRUSTER SHROUDS
JR
SHELL INSTALLED
BA
A
BA
DOME INSTALLED
BA
TETHER INSTALLED
BA
PROPELLERS PRINTED
BA
ELECTRONIC TRAY ASSEMBLED
JR
THRUSTERS ASSEMBLED
GA
THRUSTERS INSTALLED
GA
FRAME COMPLETE
BA


Thruster Components
Electrical Components
Video Components
JR
MOTORS ESC ORDERED
COMPONENTS MCU ORDERED
CAMERA RPI ORDERED
WIRED & PROGRAMMED
MCU PROGRAMMED
POWER DISTRIBUTION
SERIAL TETHER DATA
RPI VIDEO SERVER
FUNCTIONAL JOYSTICKS
SENSORS PROGRAMMED
A
FUNCTIONAL VIA TETHER
VIDEO FEED
GA
JOYSTICK PANEL DESIGN
ON SCREEN SENSOR DATA
CONTROL PANEL POWER
CONTROL PANEL DESIGN
ELECTRICAL COMPLETE
Calculations
CONTROL PANEL FINISHED
BUOYANCY
PRESSURE
CAMERA COMPLETE

Project Timeline:



Parts List and Budget:

Parts	Manufacturers	Quantity	Price
Stepper Motor 48byj	ELEGOO	2	5.00
Camera Module	ArduCam	1	29.99
PETG Filament	eSun	2	24.00
Arduino MCU	Arduino LLC	1	35.00
Raspberry Pi 4 CPU	Raspberry pi	2	61.70
Joystick	ELEGOO	2	15.00
ESC(20A)	HobbyKing	4	50.99
Motors	HobbyKing	4	28.99
Temperature and Pressure Sensor	Measurement Specialities	1	19.36
Tether wire	BlueRobotics	6m @ $5/m	30.00
Screen	Sunfounder	1	110.99
PSU (12v 30A)	MeanWell	1	62.50
Keyboard/Mouse	Logitech	1	25.99
Pelican Case	Pelican	1	0
3D printed Shell		1	~30.00
Arduino Nano	Arduino	2	15.98
Screw Terminals	Pursuit Electric	2	13.55
6 IN Dome	TELESIN	1	14.99
RS485 USB		1	6.99
RS485 Board		2	8.49
Plastic sheet 3/8"		2	16.67
14GA Wire RED/BLACK 25FT		1	23.48
14GA Wire YEL		1	13.98
USB LINKER ESC		1	14.99
		Total	$644.64

Delivery:

Fully functional vehicle with functions listed in Design Specifications. Design will be tested by traversing an area in the water to verify the video is working with specific models.

Testing:

The first to begin is testing on sealed components before adding electronics by submerging to the depth rating and checking for leaks. Electrical testing will be carried out to verify fully functioning systems before installing. Buoyancy will be tested for the fully assembled ROV by placing in water and visual inspection and adjustments will be made by adding weights as necessary. Video will be verified by a screen in real time.

Frame Design Change: First Design(TOP) Second Design (Bottom)