

Design and Development of an Autonomous Underwater Vehicle

Semester Update

Presentation

Team 23

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Advisors: Dr. Jonathan Clark, Dr. Bruce Harvey

Sponsor: Dr. SHIH, NEEC

Presenters: Erik Olson, Jordan Clein, Corey Cavalli

Project Background

Accomplishments from last semester:

- ▶ Framework for a new hull
- ▶ Replacement for zotac
 - Laptop replacement for zotac malfunction
- ▶ Framework for marker dropper
 - Testing at the end of this week
- ▶ Replacement air system
 - Old valve system severed, replacement parts, ordered
- ▶ Working code
 - Integration of parts necessary for testing



Figure 1: Current AUV

Competition Rules

- ▶ Competition rules released January 2016
- ▶ Objective of the competition:
 - Demonstrate the submarine's ability to navigate autonomously and perform a series of tasks

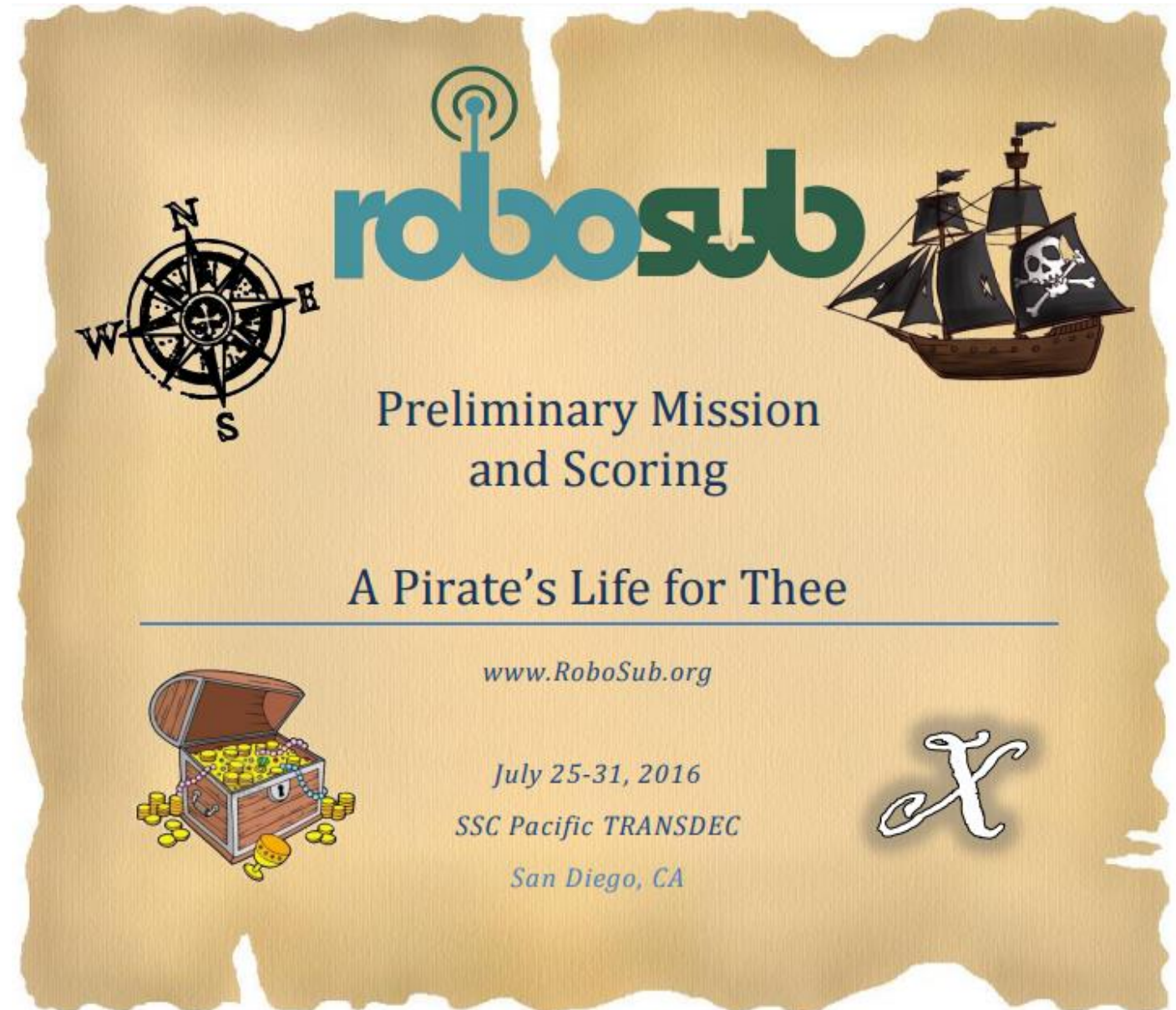


Figure 2: Robosub Competition Rules cover image

Competition Tasks

1. Follow path markers
 - Follow orange markers between the tasks
2. Scuttle a ship
 - Interact with buoys
3. Navigate a channel
 - Pass over an Obstacle

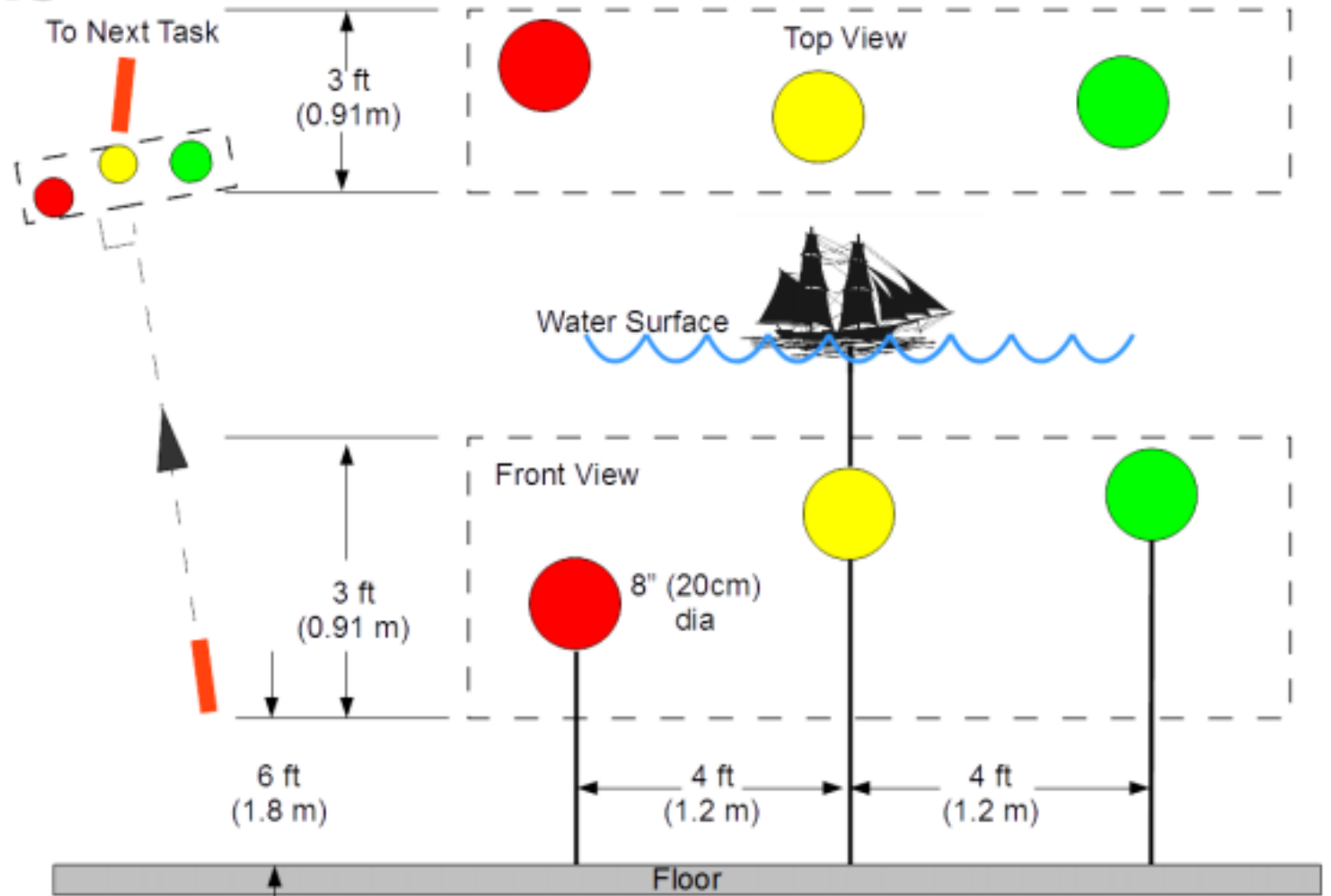


Figure 3: Buoy Interaction Task

(drawing not to scale)

Competition Tasks (continued)

4. Weigh anchor
 - Drop a marker
5. Set Course
 - Fire a torpedo
6. Bury a treasure
 - Locate, pickup, and move an object

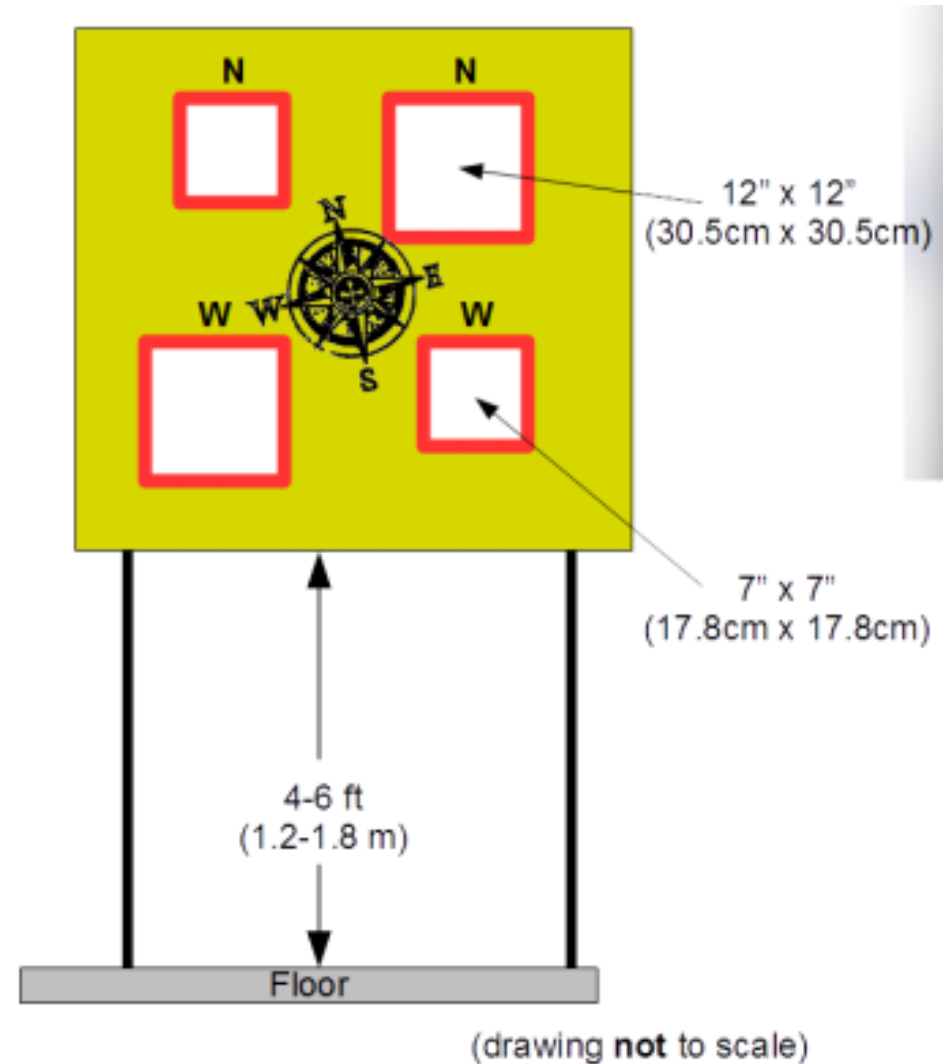


Figure 4: Torpedo task target

Renewed Objectives

- ▶ First and foremost: Finish the sub
 - Adapt subsystems to complete updated competition rules
 - Order material and fabricate new hull
 - Fix the air system for land and water testing (gripper, torpedoes)
 - Integrate with cameras
 - Debug

Hull Update

- ▶ New hull CAD and buoyancy calculations
 - Sub will weigh 73 lbs and will have a displacement of 74 lbs
- ▶ Switching to stainless steel for higher density
- ▶ Wet connectors
- ▶ Toggle latches for easier access
- ▶ Electrical insulation for inside hull
 - Reorganization of internal electronics



Figure 5: Waterproof Connectors

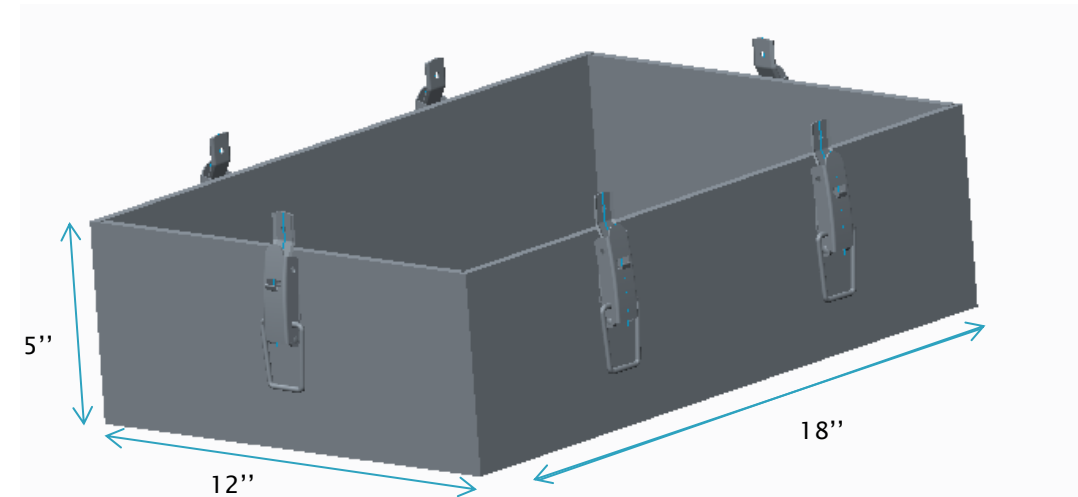


Figure 6: Modified Hull

Air System Update

- ▶ Created order forms for new components
 - Actuators
 - Tubing
 - Airtight and waterproof seals
 - Electronic relays for actuators
 - Acquired 12v battery
- ▶ Upgraded old air system design
 - Awaiting arrival of orders to assemble



Figure 7: Air Cylinder comparison

Torpedoes Update

- ▶ Fabrication of new torpedo
 - Plaster Mold
 - Plaster of Paris
 - Hard ceramic used to mold around 3d printed torpedo
 - Recoverable molds
 - Material: Simpact 85A urethane rubber
 - Relatively high density rubber (sinks in water)
 - Easy pour but short pot life for rubber positive mold
 - Degassing process for cleaner parts
 - Total time of Fabrication:
 - 2 days for 2 part plaster mold
 - 2 days full rubber to cure



Figure 8: Torpedo Plaster Mold

Gripper/ Marker Dropper Update

- ▶ Gripper air actuator
 - Mounting actuator onto Hull frame
 - Development of end effectors (ECE led)
- ▶ Marker dropper
 - Development of a compliant servo arm
 - Mounting actuator onto Hull frame



Figure 9: Airtac Gripper

Gantt Chart Spring 2016

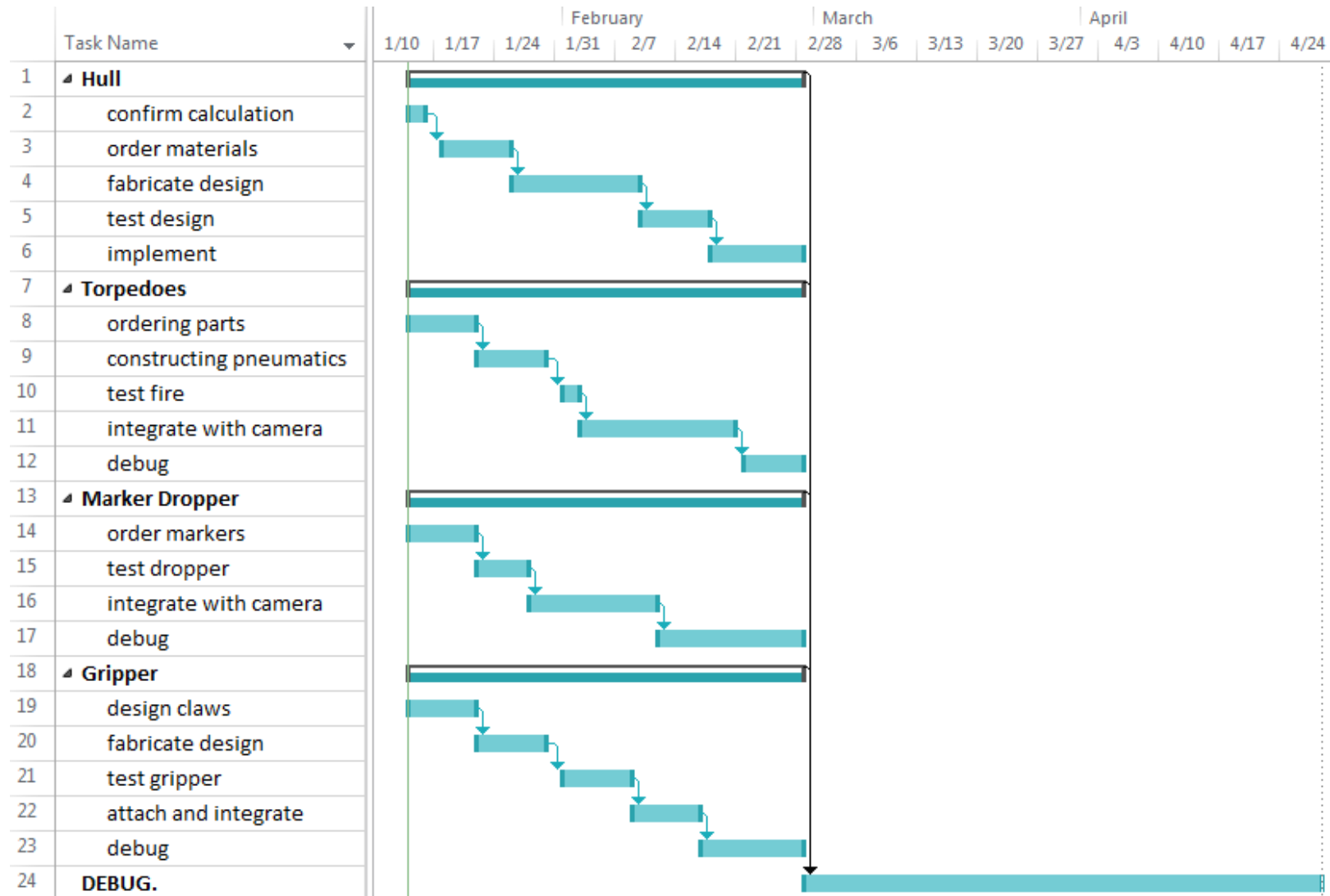


Figure 10: Gantt chart of task and time allocation for spring 2016 semester

Testing Schedule

| Test | Date |
|-----------------------|-------------------|
| Gate Navigation | January 22 |
| Marker Dropper | January 22 |
| Gripper and Torpedoes | February 1 |
| Testing of New Hull | February 10 |
| Systems Integration | End of each Month |

Conclusion

- ▶ Adjusted subsystems to newly released rules
- ▶ Redesigned pneumatics system
- ▶ Finished hull calculations
- ▶ Ordered parts and awaiting arrival
- ▶ Created testing schedule

References

- ▶ <http://www.auvsifoundation.org/competitions/competition-central/robosub/robosub-team-central>