Nimitz High School
Team 1

Nimitz High School- TSA Chapter 350

Team Members:

Edward Berlanga - Team Leader/Co-Driver

Juan Castillo - Engineer

Mauricio Lopez - Tether man

Adam Bridges - Documenter

Joshua Gilyard – Camera Driver

Michael Mathis – Air Valve Operator

Maria Cabello

Jose Berlanga

Erma Trevino

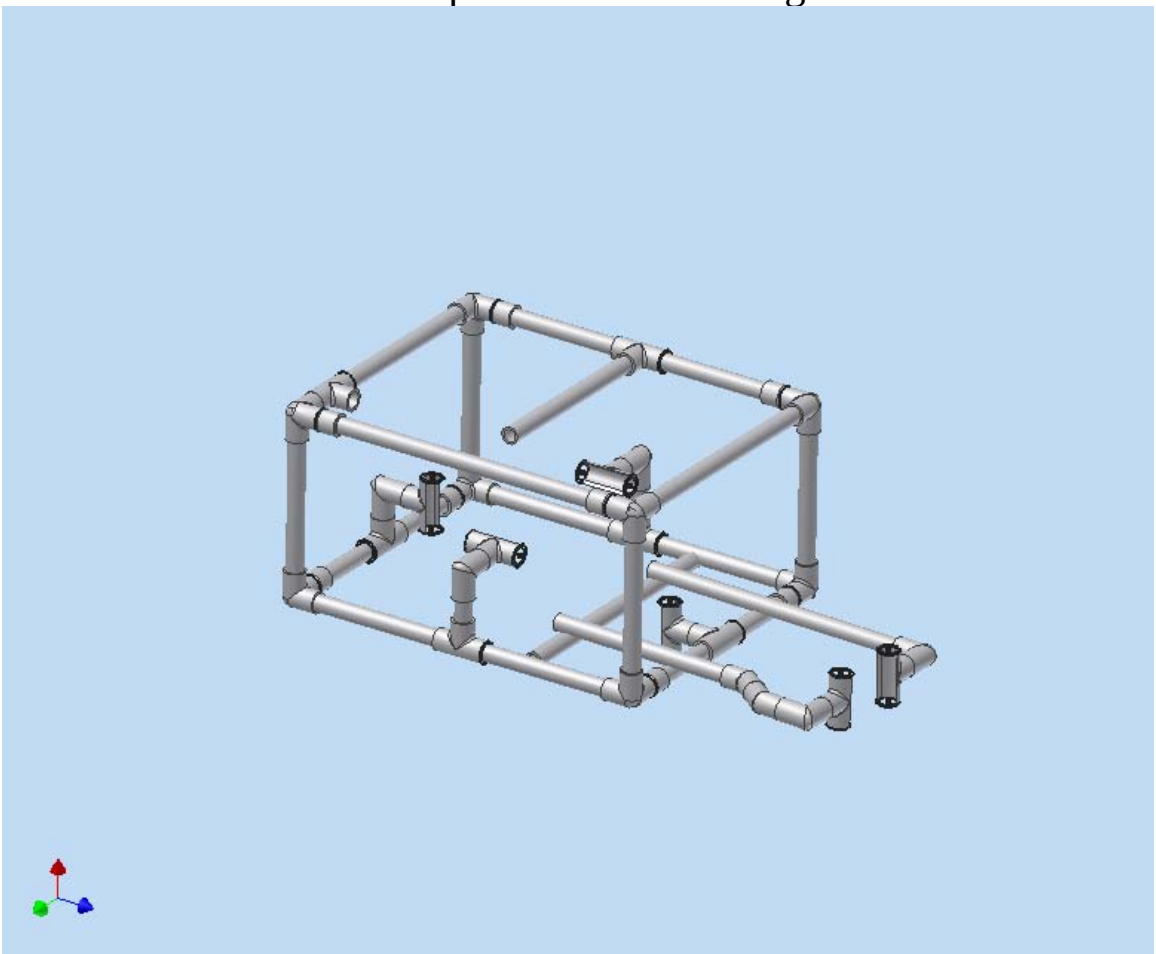
Instructor:

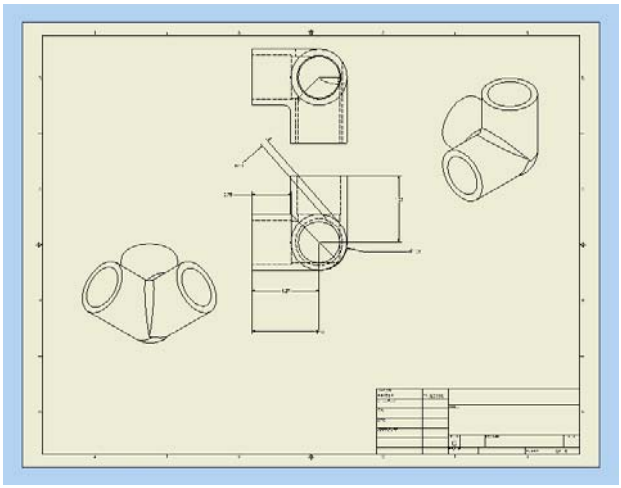
Gary Rodgers

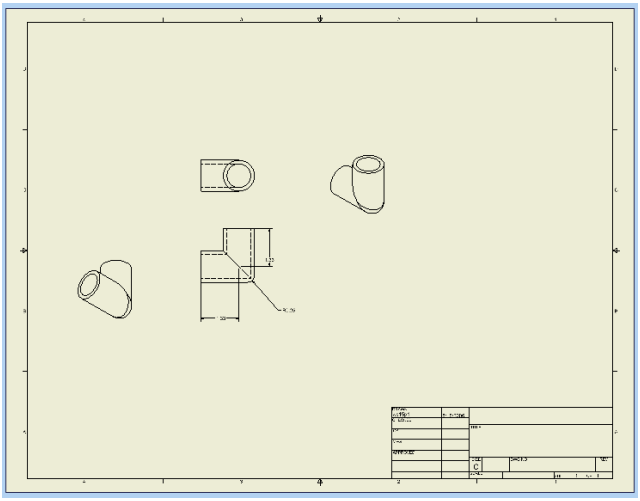
Abstract

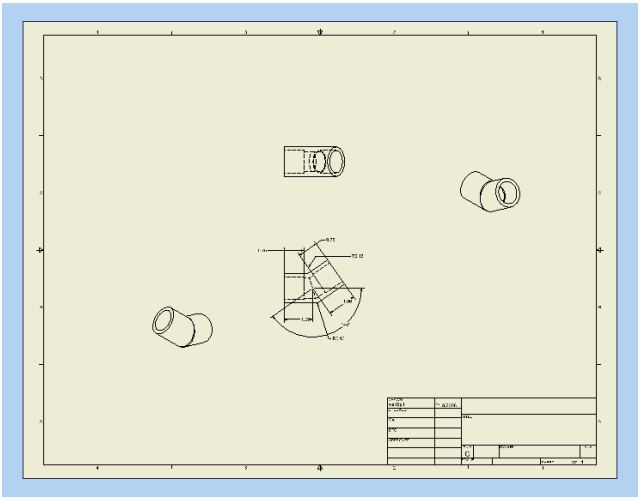
Our goal as a team was to create a robot that could complete all the missions efficiently and quickly. We used PVC, a water sealed camera, a pneumatic piston, a jumpstart battery, a tether, switches and many power tools to build our ROV. We would eventually design and build two robots to see which robot would work the best. Building our ROV wasn't a simple task; it took many hours of hard work and designing to make the ROV work properly. Our team also had to be able to communicate clearly so that we could accomplish all of our goals. Overall everyone on the team learned new things and had a good time working on the ROV.

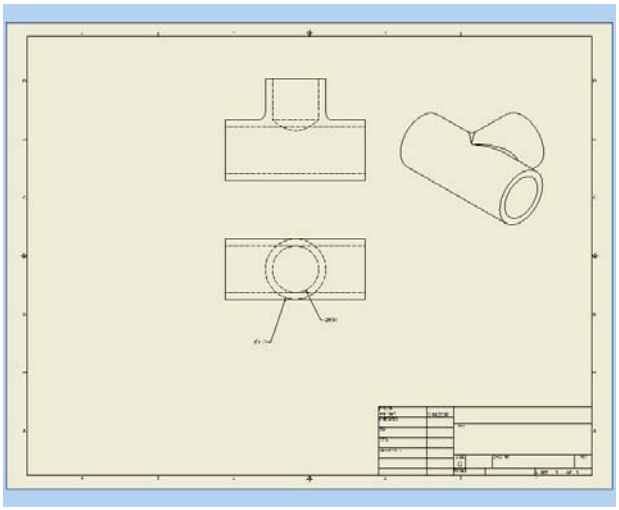
Robot pictures and drawings











Budget sheet

School Name: Nimitz High School **Period:** 6

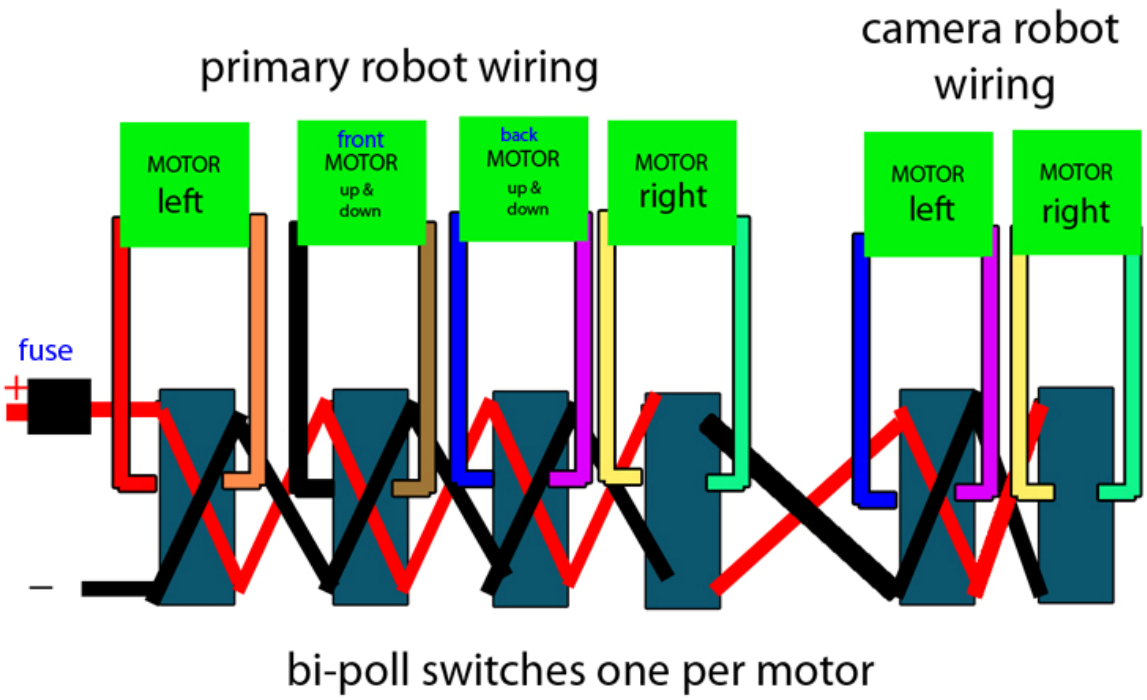
Instructor/Sponsor: Gary Rodgers **From:** Jan 4, 2006 **To:** April 29, 2006

Funds

Date	Deposit or Expense	Description	Notes	Amount	Balance
1/5/2006	$5.89	Control box		$5.89	$5.89
1/5/2006	$8.99	Terminal strip		$8.99	$8.99
1/5/2006	$0.16	PVC tee		$0.16	$0.16
1/5/2006	$1.06	Hose clamps 23-70 mm.		$1.06	$1.06
1/5/2006	$0.14	PVC 90 elbows		$0.14	$0.14
1/5/2006	$1.49	Propeller		$1.49	$1.49
1/5/2006	$3.00	Propeller adapter		$3.00	$3.00
1/5/2006	$8.99	Wirepro crimp tool		$8.99	$8.99
1/5/2006	$12.60	V625 motor		$12.60	$12.60
1/5/2006	$0.29	PVC 45 degree elbow		$0.29	$0.29
1/5/2006	$0.19	PVC 1/2 inch cap		$0.19	$0.19
1/5/2006	$0.89	PVC lenova 1 inch X 1/2 inch tee		$0.89	$0.89
1/5/2006	$0.73	PVC 4 way (cross)		$0.73	$0.73
1/5/2006	$9.49	7" diagonal pliers		$9.49	$9.49
1/5/2006	$9.97	PVC tubing cutter		$9.97	$9.97
1/5/2006	$1.89	HD inline fuse holder		$1.89	$1.89
1/5/2006	$1.99	Battery charging clips pk of 2		$1.99	$1.99
1/5/2006	$3.37	Auto flip switch 6 way		$3.37	$3.37
1/5/2006	$1.99	#30 drill bit		$1.99	$1.99
1/5/2006	$6.46	Highland terminals spade		$6.46	$6.46
1/5/2006	$18.49	Machine screws stainless 2 in		$18.49	$18.49
1/5/2006	$3.49	Machine screw nuts		$3.49	$3.49
1/5/2006	$1.69	Tartan 1710 electrical tape		$1.69	$1.69
1/5/2006	$6.10	Wire nut box of 100		$6.10	$6.10
1/5/2006	$10.00	1/4" hollow plastic rope 50 ft		$10.00	$10.00
1/5/2006	$8.99	Sterilite 122 qt. box		$8.99	$8.99
1/5/2006	$10.99	12 ga. wire red 100 ft.		$10.99	$10.99
1/5/2006	$10.99	12 ga. wire black 100 ft.		$10.99	$10.99
1/5/2006	$18.99	Digital fish scale		$18.99	$18.99
1/5/2006	$7.78	PS-1 controller		$7.78	$7.78
1/5/2006	$1.78	fuse		$1.78	$1.78
1/5/2006	$265.00	Color video camera		$265.00	$265.00
1/5/2006	$39.99	Compact jumpstart battery		$39.99	$39.99
1/5/2006	$1.35	Side outlet tee		$1.35	$1.35
1/5/2006	$0.19	Threaded adapters		$0.19	$0.19
1/5/2006	$41.65	Basic stamp		$41.65	$41.65
1/5/2006	$44.00	Motormind		$44.00	$44.00
1/5/2006	$10.00	Custom board		$10.00	$10.00
1/5/2006	$5.00	Electrical parts for board		$5.00	$5.00
1/5/2006	$1.08	PVC pipe 10 ft.		$1.08	$1.08
1/5/2006	$8.47	Wire strippers		$8.47	$8.47

1/5/2006	$22.47	Zip ties	$22.47	$22.47
1/5/2006	$21.99	Solder station	$21.99	$21.99
1/5/2006	$20.00	CAT5 50 ft.	$20.00	$20.00
1/5/2006	$45.00	Air tank	$45.00	$45.00
1/5/2006	$5.00	Piston	$5.00	$5.00
1/5/2006	$6.95	Drill set	$6.95	$6.95
1/5/2006	$10.00	Screwdrivers	$10.00	$10.00
1/5/2006	$5.00	Tool box	$5.00	$5.00
1/5/2006	$80.00	Voltometer	$80.00	$80.00
1/5/2006	$792.20	SUM	$792.20	$792.20

Electrical Schematic



bi-poll switches one per motor

Design Rational

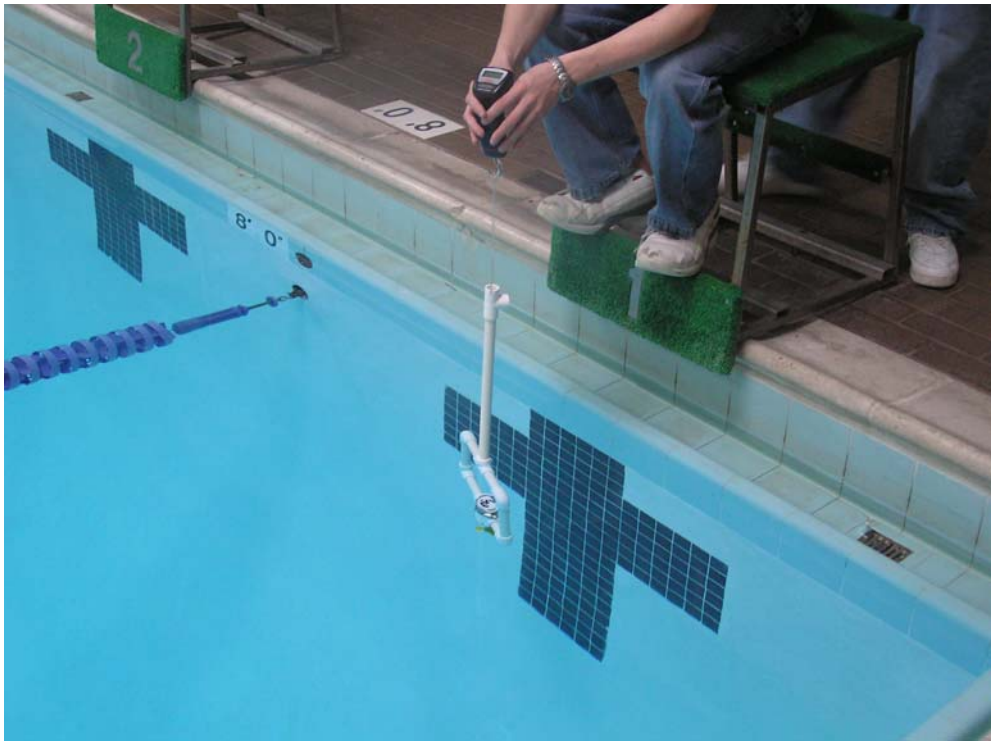
We first began our design by choosing the proper motors and propellers for the robot. We tested three different types of propellers. One was yellow with a small diameter and blade width. The second was brown with a larger diameter and blade width. The third propeller was grey, and was shaped like an airplane propeller. Each propeller had two blades. We tested each propeller with the same motor and a device we used to test the trust. To our surprise the grey propeller, which was the largest, delivered the least amount of trust. The brown propeller delivered the greatest thrust.

We also tested the thrust of all of our old motors to see which ones delivered the greatest thrust. We also tested some new motors we received. The old motors delivered an average of about 250 grams of thrust and the new motors averaged about 400 grams of thrust.

Once we had the most powerful motors, we tested for proper floatation. We tested three different types of floatation, noodle foam, packing foam, and knee board foam. The noodle foam and the packing foam would both loose bouncy because they would collapse under water pressure. The knee board foam worked best because it did not collapse under water pressure and maintained shape. We also thought about using a bladder or balloon for floatation, but we new that the balloon would collapse under the water making it hard to maintain neutral bouncy.

Our first controller used a play station remote control and a BASIC Stamp Editor V2.2 to program the circuit board. With the new motor the circuit kept overheating due to too many amps being pulled by the new motors. We then tried basic switches which worked fine, but we used two boxes to hold the switches which made it easier to through multiple switches at one time.

We constructed the challenge materials such as the box, fame, and plug for the first challenge. We also created the devise for the second challenge using a bucket to weigh down the devise.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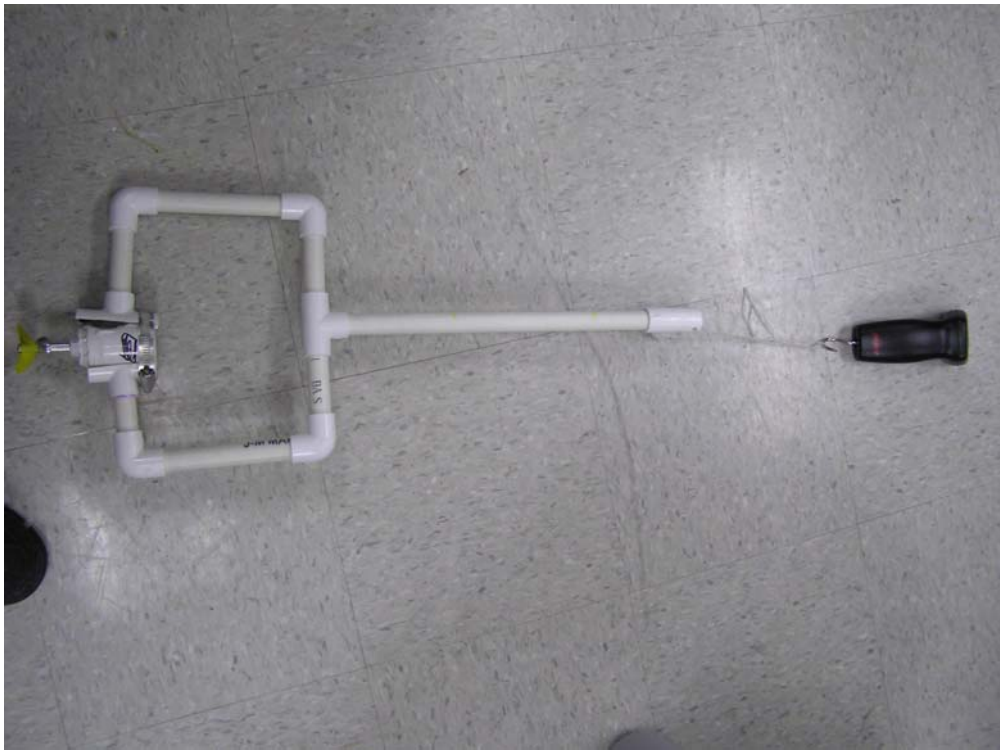
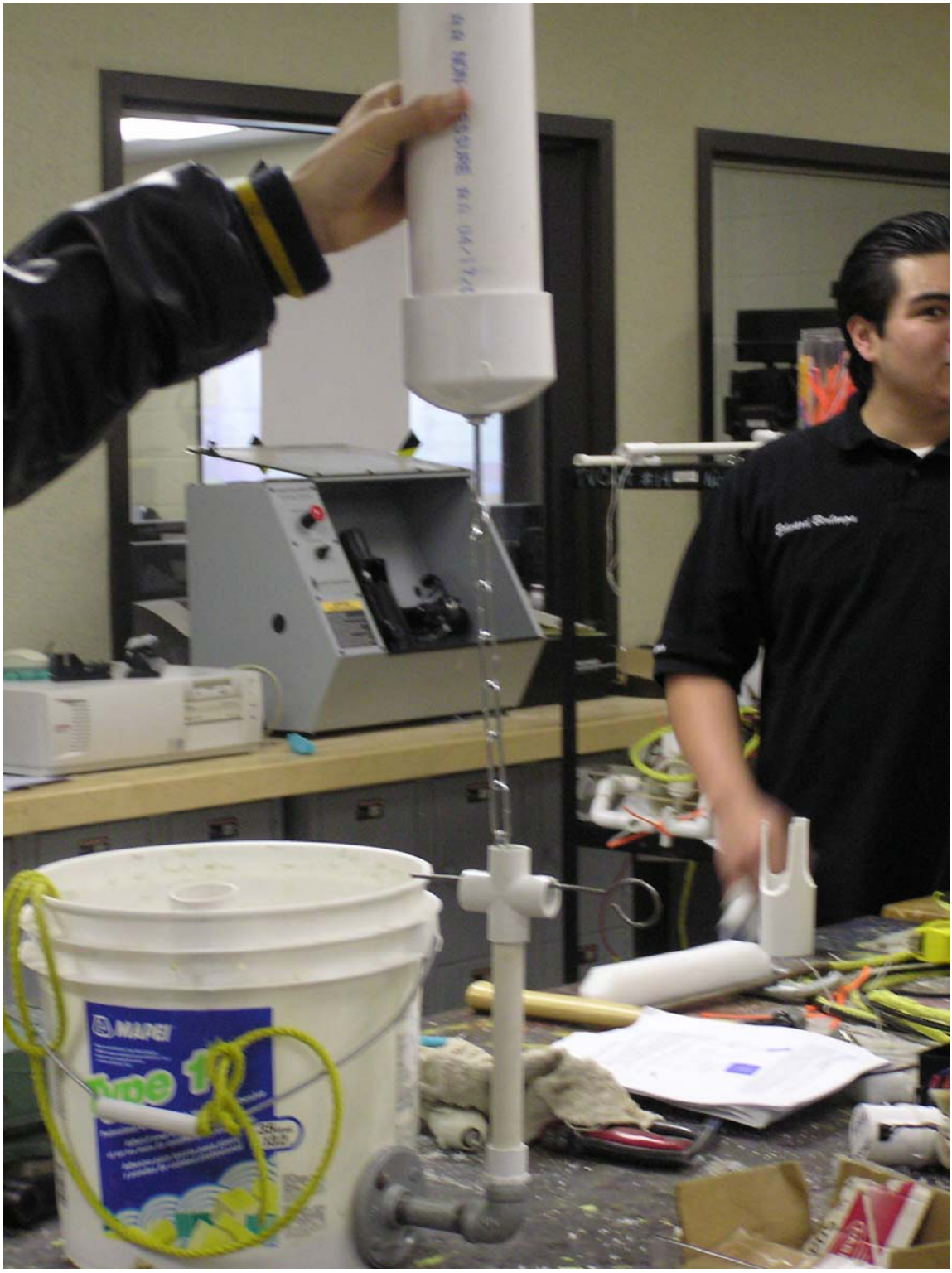



CLASS ACT


MAPEI

Challenges
Problems Encounters

When we tried to control the robot with the box we made we found that the robot would just sick making it impossible to control. We thought about adding more floatation to the robot, but that would make it float too much without the box. We added extra floatation to the claw that would release once we had dropped the box in the frame.

Our view was also restricted with the one camera pointed at the claw. We constructed another smaller robot which consisted of a piece of floatation, two motors, and a camera pointed down. This camera robot would give us an eagle view of the robot because it would float on the top of the water.

Troubleshooting

Start documentation journal
1. Analyze the problem
2 .Develop a hypotheses
3 .Test the hypotheses
4. Start at the beginning
5. Change one thing at a time
6. Evaluate results
7. Repeat until the problem is solve
8. Write final report

Future Improvements

The only improvement that our team can do is more time designing a position for the camera. We need a camera to look down below and one to look forward. Shortly before the competition we decided to add an additional camera for better view.

Weekly Journal

Week one: January 4, 2006

This day marked the beginning of our group as we were assigned together as Team 1. During this time we assigned all members a job so that all our resources and man power were efficiently used. The team itself consisted of Eric Prado, our team leader and mentor in the underwater robotic project, Edward Berlanga, our robotic engineer who designed the robot in its entirety, Timothy Truong, our documenter who recorded our logs, James Wilt, robot operator and driver, Robert Blackwell, our grunt. We assigned members based on past experience and their expertise in any fields they knew. For Eric's experience being part of a robotics team within previous years he was the most obvious choice as team leader. Edward Berlanga possesses an outstanding skill of construction and understanding blueprints of the robot. Timothy Truong is our documenter due to her ability to successfully organize paperwork and our report logs. James Wilt has extreme knowledge of using the controller and has high hand to eye coordination. Robert Blackwell will provide assistance to those who require it.

Week two: January 11, 2006

This entire week has been devoted on the operation of the robot. After selecting what we believe will be an efficient design for our robot, we began assigning who would prepare the frame with what materials and what wires were required for the four motors. During this time Eric and Tim were assigned to looking at the robotic manual and ensured understanding of the rules.

Week three: January 18, 2006

Now that all the materials are prepared, Edward and Robert began construction on the robot frame while Tim prepares the motors for wiring. During this time Eric prepares the fiber glass box to be used in the competition scenarios.

Week four: January 25, 2006

During this entire week, time has been set aside to test the multiple motors that exist in the storage box. We encountered a problem of not knowing the amps and thrust of each motor. It was highly unadvised that we just place a motor on without knowing its power or ability to move.

Week five: February 1, 2006

Motor testing continued from last week with all using a standard propeller. After discovering multiple models of propellers, we began testing all motors under different propellers and see how efficient each one was. After the long two weeks of testing each motor, four were finally selected.

Week six: February 8, 2006

Our team has been split into two different groups one for engineering, and one for documenting our progress. Timothy Truong has begun interviewing each teammate for an evaluation of our speaking skills. We agreed that each teammate should speak about his or her contribution to the robot. We have learned that Mr. Ike Coffman will give us new motors. These motors are stronger and capable of a stronger push. However, in acquiring new motors we believe that a new design to our robot is necessary.

Week seven: February 15, 2006

This week has proved interesting turns and surprises as we receive new motors and propellers. We have decided to use a ladder design for our robot so our only option currently is to dismantle our first design and rebuild it. During the course of this week, and possibly the next we shall have to test these new motors out with their propellers to determine each of their thrust and amp output. We are currently investigating the new design for our robot but are disappointed in the results that have been recorded. It seems that the ladder design we had created had failed in the

testing stages and our group has been forced to dismantle not only our robot but our control box as well. During our tests, the circuit boards overheated and we had to shut down the robot to prevent it from blowing a fuse.

Week eight: February 16, 2006
We created a new control box along with a rebuilt model for our robot. The new control box fits the driving characteristics of our driver James Wilt. Our team decided on a new improved design. The idea originated from Robert Blackwell, the idea came to him when we accidentally took apart our robot and Robert noticed the robot was smaller and lighter when it was divided in half. In order to speed the process of our troubleshooting techniques Eric Prado has decided to assemble the electronic control box.

Week nine: March 6, 2006
Eric Prado has successfully completed the control box and has tested it within the pool. We discovered that even though it does operate successfully, it's not completely efficient. We are now exchanging the forward, reverse, clockwise, and counterclockwise moments with a separate unit run off of its power supply. This device has proven that if two motors had their own power supply instead of sharing with all four, that it had the ability to run faster and much smoother. We made some minor changes to our robot and have come to the conclusion that our robot is to small. Its size doesn't allow for our robot to be balanced with buoyancy. Our engineer decided to build a new simple robot. It will allow us to test out any new ideas for the upcoming competition, and then we can use the research to incorporate it in to a better robot.

Week ten: March 20, 2006
On this week, after our Spring Break, our team had to go back to work on rebuilding and reinforcing our robot to prevent our motors from spinning around on their support. The new model is scheduled to be completed on Tuesday along with the old standard

control box consisting of two linked boxes with four separate switches. Also this week our entire team was assigned to build the practice box to use for our underwater missions to get a feel for what we will deal with at competition. The only minor setback is to purchase the necessary supplies in order to create the box as well as to replace the already worn out parts on our robot. They were worn out due to all the times when we had to take the pipes apart only to redesign the robot or reinforce some of the joints. Due to that fact, some parts are not able to perform at optimum levels any longer and require replacement.

Week eleven: March 27, 2006
With the installation of cameras onto the robot, it has been difficult to balance the robot with the newly added weight. Because of the new difficulty of piloting the robot, everyone on the team has a chance now to test drive the robot to determine who can do it efficiently. The team is also currently decided whether or not to add a secondary camera to the rear of the robot at an angled slope to allow the driver to see more towards the bottom of the robot.

Week twelve: April 3, 2006
Throughout this week, we have been trying to balance out the weight system of the robot to allow whoever drives it to be able to efficiently complete the mission tasks.

Week thirteen: April 17, 2006
The team has completed all it can on robot and now has resumed work on the leftover paperwork. Currently at work are the technical report, presentations, as well as the rehearsal for it. Edward now ensures that all the equipment will remain in working order before the competition as well as any other type of maintenance.

A new skill gained

Throughout the process of this project, we learned to work as a team and see things not through only our eyes, but as the eyes of a group and see how everyone thinks on the ideas and plans for the robot. We have grown to work better as a team and more efficient then when we first started.

Acknowledgments

Team 1 would like to thank these following people: first out sponsors Mr. Gary Rodgers and Mr. Reagan Blake for their support, guidance, and assistance in building our robot. Mr. Ike Coffman from Alvin Community College for his support and by contributing so much time to assist us with our design, and finally our school principal, Mr. Ken Knipple for his gracious support and allowing us to use the school swimming pool for our tests and practicing. We would like to especially like to thank NASA and the Neutral Bouncy Lab for providing the finest facilities, and the opportunity to challenge our selves and do our best.