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Underwater Wireless Power Transfer

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Outline

- Introduction
- Problem Definition
- Current Status of Art
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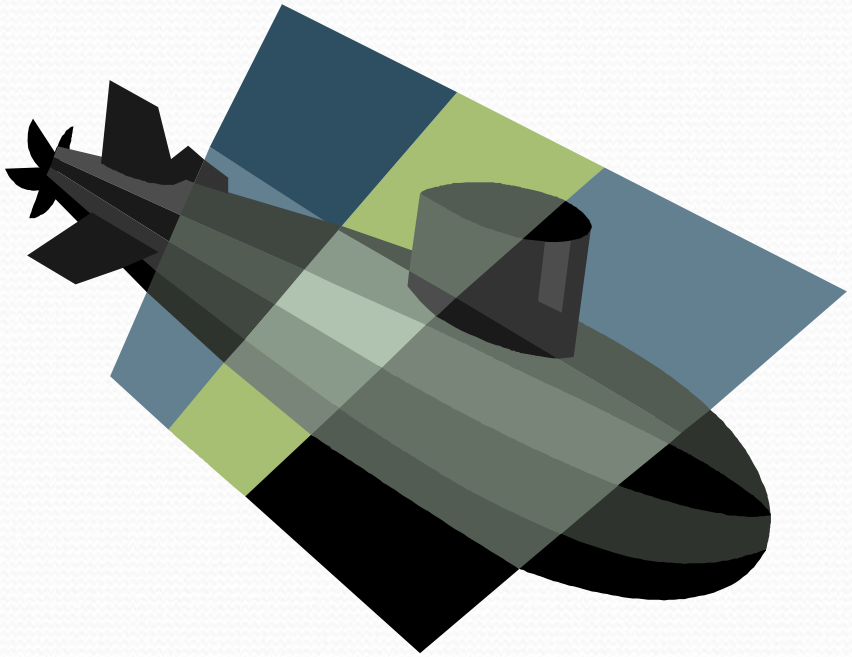
- Project Management
- Conclusion



Introduction

Objective:

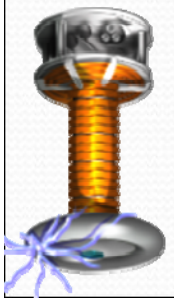
- Wirelessly charge an unmanned underwater vehicle (UUV) through inductive power transfer

What is that?

- Contactless between source and object through magnetic induction
  - Same Resonant Frequency
  - Mutual Induction

Why?

- Sponsor : Northrop Grumman
  - Base station
  - Without Resurfacing



Problem Definition

- Design a system to wirelessly connect to and power up UUV
- System must work optimally in following conditions
  - 300 feet under water
  - Transmit in a range of up to 1 meter
  - Interface with on-land computer / controller
- Transfer 100 VDC, 10 amps, 80% efficient
- On station time of 30mins
- No official underwater constraints found
- Be safe in underwater conditions

Current Status of Art

An idea that's been approached in a wide variety of ways…

- Laser Wireless Power Transmission
- Powercast
- eCoupled Technology
- US Patent 6489745 (Contactless Power Supply)
- MIT Inductive Power Transfer Experiment
- US Patent 5301096 (Submersible Contactless Power Delivery System)

Engineering Approaches

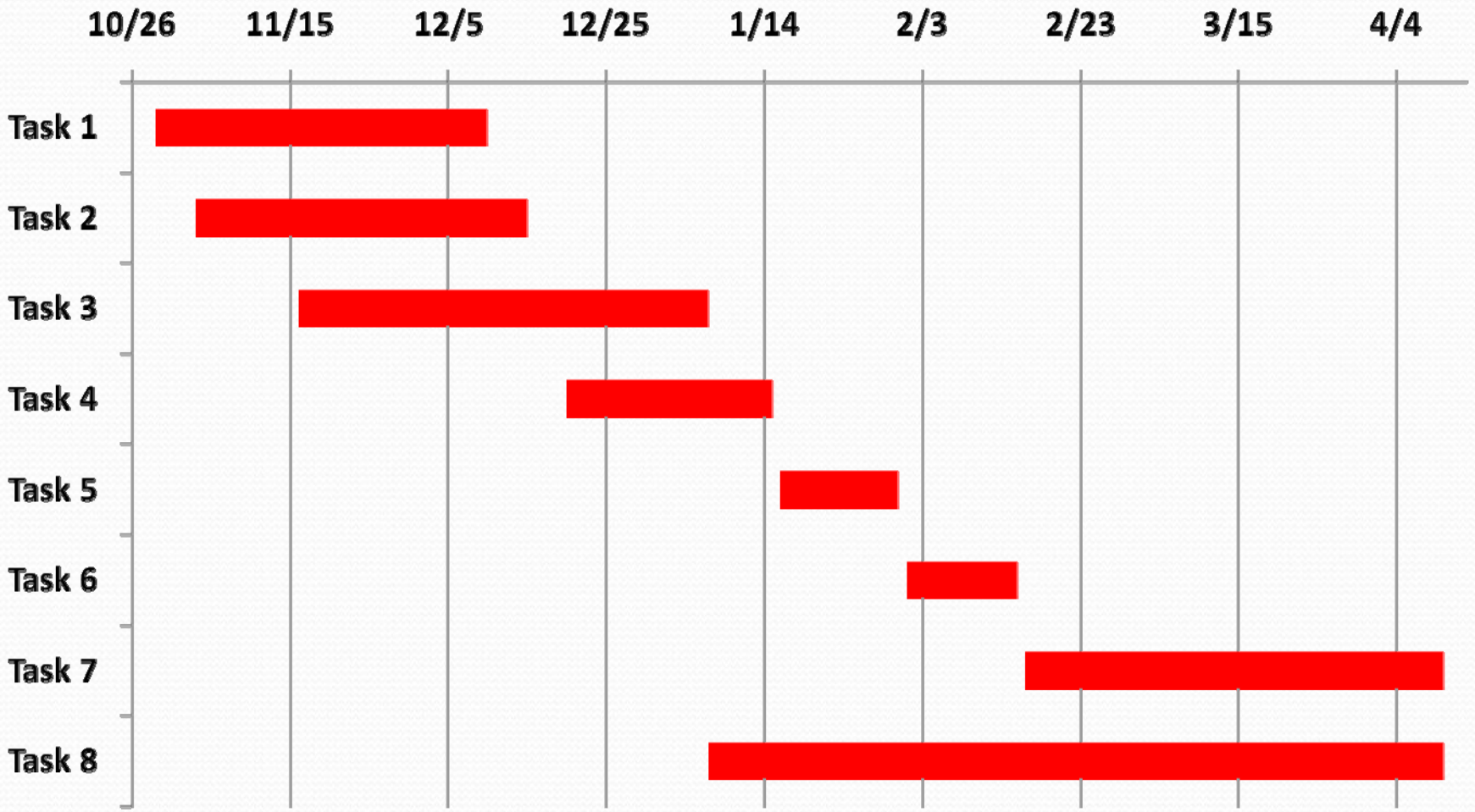
Main Solution:

- Inductive coil power transfer
  - Primary and secondary coil; water as medium
  - Most feasible
  - Cost effective
  - Can use existing knowledge
- Other alternatives:
  - Self-Powered UUV with wireless on-land interface
  - Radio or Laser Frequency using large vacuum tube

Tasks

1. Have the project proposal approved
2. Preliminary Research of inductive power transfer in air
3. Underwater Research
4. Create Schematics
5. Successfully simulate schematics
6. Order necessary materials
7. Build and test real life model
8. Write technical report

Project Management



Budget

Materials- $700

Misc.-$300

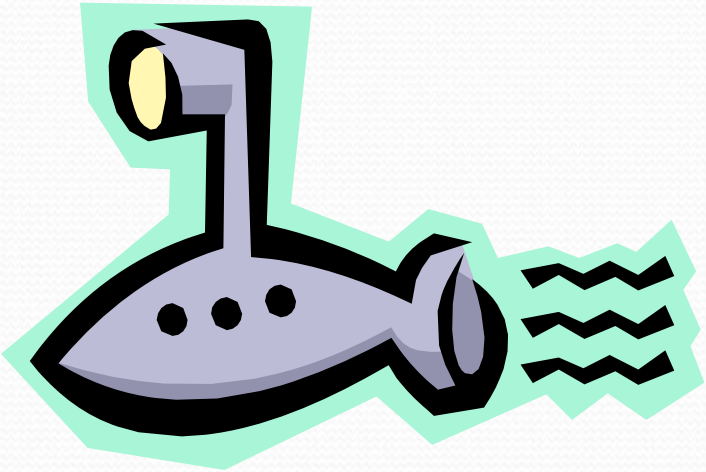
Total = $1,000

Note: Where the materials will be used for the model and include but not limited to:

- Ansoft — Free
- MATLAB — $99.00
- Wires — $50
- Magnets — $150
- Battery — $50
- Packaging — $150
- LED's and Circuit Boards — $100
- Electronic Devices — Free

Conclusion

- Expand range of travel of UUV
- Recharge battery without resurfacing
- Main Solution: inductive power transfer
- System Requirements:
  - Transfer 100 V dc with 10 amps
  - Transmit in a radial range of at least 3 feet
  - Should have a minimum of 80% efficiency
  - On-station time of up to 30 minutes
- Alternate Methods:
  - Self-Powered UUV
  - Vacuum tube
- Finish Date: April 10, 2009 and Budget: $1000



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Questions