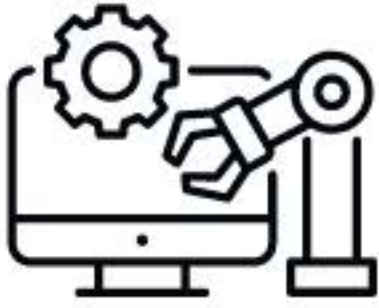


Tow-morrow's Launch



How can advanced manufacturing technologies be utilized for critical operations in high-stakes environments?

Suggested Equipment Skill Level

Intermediate User

Equipment Skills

Block Coding
3D Design

Marine Designer

Career & Skillset Connections

- Project Management
- Communication
- Spatial Visualization

Project Guiding Themes

- Engineering design process
- Coding the RVR+ to meet constraints
- Integration of manufacturing technologies

Suggested Software & Materials

- Sphero App
- 3D modeling software
- 3D printer/CNC Machine

Aligned VDOE CTE Course(s) and Competencies

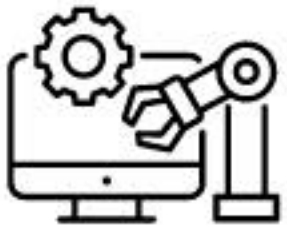
Technology of Robotic Design

36-Weeks

Engineering Drawing and Design

36-Weeks

Tow-morrow's Launch



Mobile Robot Intermediate Skill Level

How can advanced manufacturing technologies be utilized for critical operations in high-stakes environments?

Project Problem & Career Prompt

You are part of a research and development team contracted by the U.S. Navy to create an automated tow tractor to be used on an aircraft carrier. Your team consists of you (a marine designer), an automation and control engineer, project manager, and a quality assurance representative. The U.S. Navy has provided you with a pilot and flight deck crewman to use during the design process. They have also supplied your team with some advanced manufacturing equipment to be used to create the prototype. Your team must present and demonstrate a working prototype to the U.S. Navy before they will order you supplies for the final product.

Project Background & Resources

How aircraft carriers work:
<https://science.howstuffworks.com/aircraft-carrier.htm>

Examples:
<https://towflexx.com/military/tf5-milspec/>
<https://www.mototok.com/tugs/military>

Investigative Questions

-What are the optimal control and automation technologies that should be incorporated into the tow tractor to ensure precise and safe maneuverability on the flight deck?

-How can the automated tow tractor be designed to ensure compatibility with aircrafts that are present on the aircraft carrier?

Project Criteria

-Working prototype must be tested on a mock flight deck on an aircraft carrier

-Prototype must connect to a mock aircraft wheel

-Final working prototypes must be completed by the project deadline

Project Constraints

-Advanced manufacturing equipment must be used to develop the prototype

-Cannot use prefabricated 3D models

-Program used to code the RVR+ must be coded by you

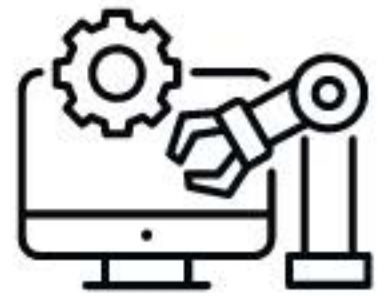
Suggested Pacing

2-3 Days of research and sketching ideas

3-4 Days of design

2-3 Days of constructing and finishing prototypes

Tow-morrow's Launch Mobile Robots



Career & Skill Set Connections

Marine Designer

A marine designer designs and oversees the testing, installation, and repair of marine apparatus and equipment.

Essential Skills

- *Problem Solving
- *CAD
- *Design Thinking
- *Attention to detail
- *Communication



Academic Pathway

High School Diploma
and
Community College/Certification
or
Bachelor's degree



Aligned VDOE CTE Course(s) and Competencies

Workplace Readiness Skills & Work-Based Learning Opportunities & Examine All Aspects of an Industry

Engineering Drawing and Design

Introducing the Design Process

Describe the engineering design process

Apply the engineering design process

Producing Illustrations

Prepare freehand technical sketches

Design an assembly and prepare working drawings as part of a design team

Create parts of the assembly using a 3D printer

Present a design solution to explain and engineering system

Technology of Robotic Design

Exploring Microprocessor/Microcontroller (computer) System Basics

Describe the software applications of computer technology within automation systems

Describe the fundamentals of computer numeric control (CNC)

Exploring the Components of Robotics and Automation Systems

Describe types and functions of sensors and intelligent systems used to analyze and expand on these functionalities

Describe various hardware and software used in the industry

Describe components or processes that typically require precision measurement



Project Management Plan

**Team
Member
Roles**

**Team
Goals
&
Timelines**

**Team
Member
Tasking**

Sketches & Design Planning



Notes

Notes