

Observe
Create
Change
Adapt
Innovate
Challenge
Win!

Enlightened Challenge 2025



The Realm of
Luminescent

The Pickup Point
The Darkside

Radiating
Reservoir

Mount
Luminosity

Fluorescent Forest

City of
Luminescence

Shiny Shore

Illuminated
Outskirts



AXIENT

Do you have what it
takes to rescue Phil
from the Dark Side?

Challenge Guide

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1.0 Introduction

The purpose of this challenge is to give students an opportunity to explore several engineering fields used in the aerospace industry. These main fields include electrical, mechanical, computer science, RF and systems. This exploration is on a broad level and intended to help explain what each field may offer as a career. The challenge is also a platform to find great new employees for our workforce. By participating in this challenge, students may be offered employment opportunities from partnering organizations. *Italicized* words listed throughout this guide are defined in **Appendix A: Glossary**.

The Enlightened Challenge is designed for students currently enrolled in an academic program that are 16-19 years of age. Participants must be US citizens and be able to pass a drug screening and background check. Participants meeting the criteria can form teams of 1-6 members. Multiple teams can be formed from one school, but participants may only be registered with one team. Students 14-15 years old may participate upon pre-approval from the challenge organizers.

To register, go to <https://portal.sspvpmo.org/enlightened-challenge/> Reference material will also be available from this site.

Problem Scenario:

One day, we (Earthlings) were experimenting in space and found a planet known as *Luminescent*. On the planet was an alien race known as the *Enlightened*, with a strange resemblance to our common light bulb. One of the Enlightened was very curious about the dark side of their planet and decided to venture off to explore. The rest of the inhabitants of this planet are now very worried about their friend as contact has suddenly stopped. They have challenged us (the Earthlings) to come up with a bright idea and help return the lost *Enlightened*. We need to hurry; he only has a short amount of time before his light goes out! Luckily, Lee (Light emitting electron), one of the Enlightened, is coming to Earth to help. He will act as our guide on finding an engineering solution to help them with the rescue. We will develop and demonstrate our ideas to them here on Earth.

1.1 Challenge Overview

Using only the items provided in the *Kit-O-Stuff*, participants will design and build a way of safely retrieving *Edison L. Bulb* (a light bulb) from the dark side of the planet and returning him to the primary city on Luminescent. There will be many obstacles that must be crossed. The area will have elements to represent mountains, rivers, forests, and caves between the starting point and *Edison L. Bulb*. The Enlightened Challenge requires Edison to be returned home in one piece and still powered. Edison has his power unit already and will not need any additional power to stay alive. As this journey has not been traveled before, you will not know the pathway ahead of time.

The Challenge will be divided into 3 major engineering fields: mechanical, electrical, and computer science. A systems engineering approach should be used to test and combine each aspect of engineering into one working system. One participant from each team will need to be assigned as the *Challenge Manager*; they will be the team leader and will help coordinate the assembly of all components. The team will choose this member. This team member will also be the primary contact to the AFRL challenge organizers for support. The teams will have 6 weeks to design, build, and be able to demonstrate their design.

Participants will decide when and where to conduct the design and build sessions. This information needs to be communicated to AFRL by the end of the 1st week. At the end of the 6 weeks, participants will meet at a final event hosted by AFRL on base. Participants will demonstrate their completed ideas at this location.

Each team’s idea for rescuing *Edison L. Bulb* will need to meet minimum requirements to transport our alien friends. The minimum requirements are described below, but adding more capabilities will brighten up our friends and is highly encouraged.

1.2 Kit-O-Stuff

AFRL will supply the *Kit-O-Stuff* prior to the start of the Challenge. Only items from the Kit-O-Stuff are allowed to be used in construction of the team’s idea. Not all items must be used. Tools are allowed to be used as needed to assemble. Each team will be allowed to select one additional component for their device, but it must be a reasonable substitute, addition, or replacement for something within the Kit-O-Stuff. The Challenge organizer must approve the additional item selected by each team. This item may also be a kit that contains multiple items. A computer (not supplied) will be needed for uploading code. Decoration, using paints and writing utensils, is allowed. After receiving your *Kit-O-Stuff* box, verify that all items found in the table to the right are included.

Qty	Kit-O-Stuff Items
1	Red Cat Racing RC Car
1	ELEGOO UNO R3 Arduino Starter Kit
10	Popsicle sticks
5	Syringes
2	12V LED Light Bulbs
2	9-volt batteries
5	Foam board sheets
5 ft	Vinyl hose
1	Super Glue
1	Roll Gorilla tape
5	Ball point pens
5	Paper clips
2	Blank CD’s
1	Bottle of water
1	Cardboard box
40 ft	Paracord
	Item of team’s choice

1.3 Challenge Map

The Realm of Luminescence will be constructed to simulate terrain found on the map. Teams may need to work through some or all of the listed territories. The last known location of *Edison L. Bulb* was 30 feet from the city of Luminescent. All sections, including Mount Luminosity with a maximum height of 2 feet, and the 1.5-inch-deep Radiating Reservoir, can be navigated using the team’s structure designed with the *kit-o-stuff*.



1.4 Mechanical Requirements

The team's design will need a structure capable of moving 1 light bulb in any orientation without breakage. Additionally, it will need to have a way to securely attach all added electronics, such as the Arduino. There are no minimum or maximum size or mass constraints as long as the design meets all other requirements.

See **Appendix B**: Mechanical and General Support for additional guidance on mechanical.

1.5 Electrical Requirements

The electrical system will need to power all electrical components used. These electrical components are required to have some form of involvement with the provided Arduino. A simple electrical schematic of the wiring system will need to be provided as part of the team's demonstration.

See **Appendix C**: Electrical Support for additional guidance on electrical.

1.6 Computer Science Requirements

Teams will need to program a microcontroller and integrate it into their idea somehow. At a minimum, the microcontroller will be required to blink a visible LED with "Don't Panic" in morse code during the recovery of Edison. The *Kit-O-Stuff* provides a very simple microcontroller. Be very careful when powering this unit as damage can easily occur if incorrectly wired. Teams can also choose to add more, or a different microcontroller, as their ***extra item*** in the *Kit-O-Stuff*.

See **Appendix D**: Coding Support for additional guidance on programming.

1.7 Safety

Safety is a top priority to Earthlings and the Enlightened. Follow common sense practices when assembling and working with tools. At the final event, a safety briefing will be provided to all participants.

1.8 Final Event

The conclusion of the Enlightened Challenge will be a final event hosted by AFRL/SSP. This event will be held in mid-April on Kirtland Air Force Base. Prior to this event, more information will be released to each team. The final event will be a simulation of the treacherous journey taken by the curious Enlightened.

The location will include a prep area for any work necessary to get the team's idea ready for demonstration. Each team will have one table and a few chairs in their prep area. Power can be available in the prep area upon request.

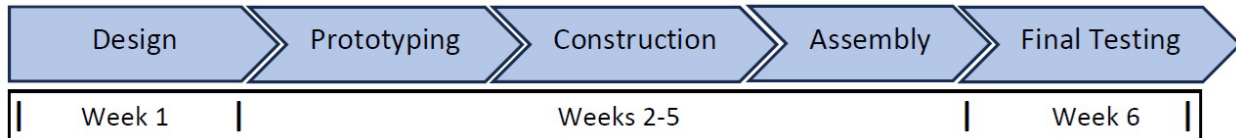
Teams will have up to 2 hours for final preparation. During this prep time, judges will come and visit with the teams. Each member is encouraged to share what they learned and accomplished. The judges will assign a 20-minute time slot in which to demonstrate their idea to *Lee* during this time. The course will also be freely open for any testing the teams may want to do during the prep time.

When *Lee* arrives on the transporter, the prep time will end. The teams will then report to the starting area at their scheduled times. There will be a 5-minute window to report, also allowing other teams to leave the course area. Multiple teams may go at the same time. Teams cannot intentionally interfere with each other and may reset and restart as many times as they want within that 20-minute window. Unfortunately, humans will be unable to physically help on the surface of Luminescent because it has no atmosphere. The use of a remote control will be our only means of interfacing with anything on the planet (the course).

Although this challenge is about engineering design, testing, and creativity, there will be an award ceremony at the conclusion of the final event to recognize the success of the journey. Team awards will be: 1. Most creative 2. Simplest design 3. Best use of code 4. Best overall.

2.0 Pathway to Success

Ideas are great, but they are even better if they become real. So often ideas will die due to lack of time. This challenge is only 6 weeks long, so it is important to have a path to success from the start. We have suggested following the figure below for a better chance of success.



AFRL Image

The design phase is critical to the outcome of the project. This is where the “big ideas” come from. All ideas are useful during brainstorming, but attainable designs need to be created to be successful in the final event. Don’t spend too much time talking about all the little details; paper clips and duct tape solve some of the hardest problems in a pinch. Document all ideas as you may have to circle back and redesign some things later.

Prototyping is a great way to prove your ideas work. Prototyping is meant to be quick and dirty, so do not spend a ton of time doing this. Once your team feels good with the design, begin constructing and assembling it. Some redesign in the first few weeks is normal. When you reach weeks 5 and 6, however, you must get to the assembly and testing phase, or you may not finish your idea. Remember, you can always reach out for support, even when you need a small amount of help.

3.0 Support

Each week, the registered teams can meet with AFRL support engineers (virtual or in person). In these meetings, participants should share their progress and any difficulties they are having. Think of them as a helpful resource or ‘phone-a-friend.’ Participants are encouraged to reach out to the Enlightened Challenge organizer anytime they need help.

Title	Name	Contact info
Challenge Organizer	Jason Sievert	Jason.sievert.1@spaceforce.mil

Don't Panic

Appendix A: Glossary of Terms

Term	Definition
AFRL	Air Force Research Laboratory
Challenge Manager	The Challenge manager is the leader of the team. They are responsible for making key decisions on the project and meeting deadlines for the team. This position is usually filled by a systems engineer.
Edison L. Bulb	A 12v test bulb used in place of the living Enlightened beings
EDU	Engineering Design Unit
Enlighted	An alien race of beings that have a strange resemblance to humanity's common light bulb.
Exit Criteria	A set of objectives to be met for a part or system to be ready for integration into a larger system. Example: a wheel is needed to roll on a cord. After designing a wheel, the wheel is made. The wheel does not roll on the cord. The wheel is redesigned and then retested. The wheel now rolls on the cord, the test is a "pass," and the wheel can move to the next step.
Kit-O-Stuff	A box containing items to complete the challenge, provided by AFRL
Lee	Lee (short for Light emitting electron). He has traveled from Luminescent to view our ideas on how to rescue his friend.
Luminescent	The home planet of the Enlighted -- their destination.
SSP	Small Satellite Portfolio

Appendix B: Mechanical and General Support

A helpful explanation of the engineering process is available on YouTube:

[Engineering Process Video](#)

Depending on each design, the mechanical structure may be dramatically different. Remember EVERYTHING in the Kit-O-Stuff can be used, including the packaging. Reach out to the Enlightened Challenge organizers right away with any mechanical questions.

Appendix C: Electrical Support

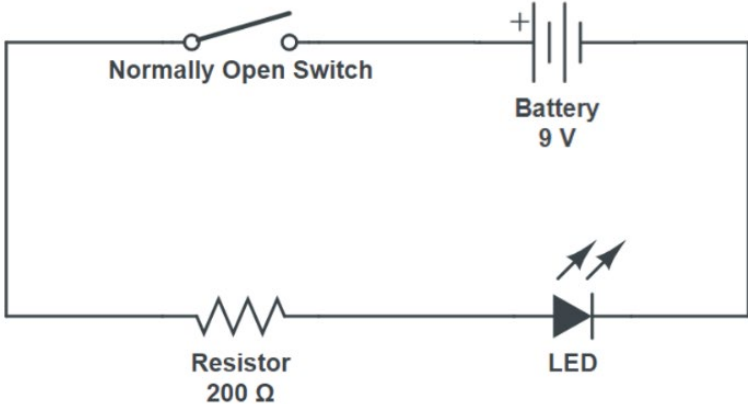
Helpful video links:

Ohms law, basic electron flow -- [Ohms Law Video](#)

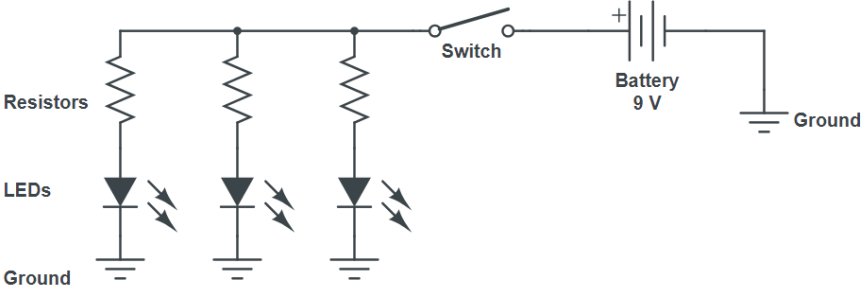
Series and Parallel circuits -- [Electrical Circuits Video](#)

Wiring Diagram Examples

Basic LED Circuit With Switch



Parallel Circuit



Series Circuit



AFRL Image

Appendix D: Coding Support

Paul McWhorter has 68 awesome Arduino tutorials. Start here first, get your iced coffee ready.

[Arduino Tutorial](#)

ELEGOO starter kit download:

[Amazon Link](#)

Arduino IDE download:

[Arduino IDE Software](#)