



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY**

Name(s) Arsh Muhib	Project Number J1719
Project Title Building a 360 Degree Periscope	
<p style="text-align: center;">Abstract</p> <p>Objectives Build a 360-degree periscope with no image disorientation, max observer comfort, max ease of use and min space requirement Step 1 I was able to create a rotating top periscope where the bottom mirror was fixed. I could see in all directions, but the images were distorted. Step 2 I was able to fix the image disorientation in my periscope by using dove prisms. When the top mirror was rotated by X degrees, the dove prisms were rotated by X/2 degrees in the same direction. This was a manual process. Step 3 - In its current configuration it is almost impractical to use in real scenarios, is very bulky and is very fragile. To get an image with no disorientation, for every position of the top mirror of the periscope, I had to figure out its deviation from normal position and then rotate the dove prism by half that amount in the same direction. This made it very difficult to use. I would like to control the rotation of the top mirror of the periscope and the rotation of the dove prism with a single control.</p> <p>Methods I redesigned my 360-degree periscope with the following criteria-</p> <ol style="list-style-type: none">1. The top mirror of the periscope should be able to rotate in all directions2. When the top mirror of the periscope is rotated by X amount of degrees, the dove prism should rotate by X/2 amount of degrees, automatically.3. The plane of rotation of the top mirror of the periscope should be perpendicular to the place of rotation of the dove prism of the periscope4. Direction of rotation should be same5. There should be no image disorientation <p>I used a spur gear assembly to translate the horizontal rotation of top mirror of the periscope to vertical rotation of the dove prism.</p> <p>Conclusions My periscope can make the life of sailors in submarines and the life of soldiers in armored vehicles very easy by saving on space and providing a 360 view of the surrounding without the observer having to move from his/her position</p>	
Summary Statement Build a 360-degree periscope with no image disorientation, maximum observer comfort, maximum ease of use and minimum space requirement to be used in submarines and armored vehicles	
Help Received I received help from Mr. Jay McKoy to cut wood in the shape of spur gears of different sizes.	