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STEM21

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Use of Additive Manufacturing Technology to Design and Produce a Bull-Bar for an All-Terrain Vehicle

Tahj I. Powell, 9th Grade
Ecotek Lab

THE PROBLEM

Most modern-day ATVs either have a bull-bar or they are not equipped with one. This bull-bar would add an extra layer of security to the driver/rider, especially on uneven terrain like in agriculture or recreational activities.



THE SOLUTION

To create a bull bar schematic using 3d printing technology. This bull-bar would be made out of TPO and will be tested to see its characteristics compared to a traditional bull-bar that comes stock with limited ATV, this will give the option of extra protection.



RESEARCH PLAN

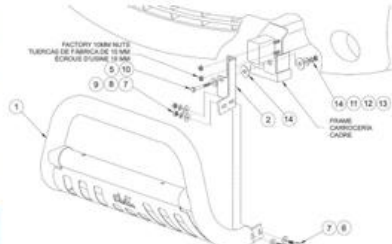
1. Understand the anatomy of the ATV and the material of the Bull-bar
2. What is TPO and how do TPO properties differ from other plastics?
3. Bull-bars: Anatomy, material, and characteristics
4. Thermoplastic Polyolefin Advantages

ATV accessories come in many different types such as Rambars, Containers, Pouches, and Snowplows. The bull-bars are an accessory that is not only protective, but they are a show of roughness and readiness for anything that may get in your way. Each bull-bar is custom made to fit certain vehicles. They are designed to be durable and are made of steel, aluminum, stainless steel, TPO (thermoplastic polyolefin), and other combination materials. Companies like Polaris, Kawasaki, Suzuki manufacture ATVs, but they often lack accessories such as a bull-bar. TPO is a material that is both strong and durable. The purpose of my research is to investigate how additive manufacturing can be used to design and produce a bull-bar for a 4 wheel ATV.

EXPERIMENTAL SECTION



Part	Feature
Frame	The main structural component that supports the engine, suspension, and other components.
Engine	The power source is typically a four-stroke internal combustion engine.
Transmission	Transfers power from the engine to the wheels.
Drivetrain	Includes the drive shaft, differential, and axles, which transmit power to the wheels.
Suspension	Absorbs shocks and vibrations from the terrain, providing a smoother ride.
Tires	Provide traction and support the weight of the ATV.
Brakes	Slow down or stop the ATV.
Steering System	Controls the direction of the ATV.
Bodywork	Protects the rider and mechanical components.
Lights	Provide visibility in low-light conditions.
Instruments	Display information such as speed, fuel level, and engine RPM.
Controls	Allow the rider to operate the ATV.



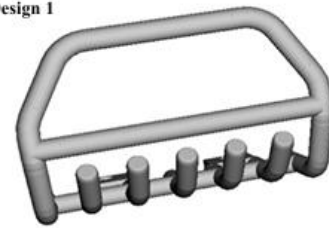
Heavy Duty Bull Bar



RESULTS

I was able to design three versions of a bull-bar using 3D modeling software. Each model is designed to scale. The material type to be used for printing is TPO or ABS, another thermoplastic that has a greater resistance to fracture than TPU.

Design 1



Design 2



Design 3



FUTURE WORK

Future projects on ATV bull bars could focus on making them lighter and stronger with new materials. We should add safety features like impact absorption and better visibility lights. It's also important to make sure they fit new electric ATVs.

Conclusion: ATV accessories like Rambars and Bull-bars are super important for off-roading. Bull-bars protect your vehicle and look cool, but companies like Polaris and Kawasaki don't offer options like TPO bullbars. Using 3D printing could make these cheaper and easier to get for all ATV fans, helping everyone gear up for their adventures!