



## Colorado Science and Engineering Fair

## 2024 Individual Project Abstract Form

**Please print 2 copies of the completed form. Sign both copies, keep 1 for your notebook and submit 1 copy to your Regional Fair Director with your other paperwork.**

Title of Project: Gutter Guardian: Gutter Cleaning Drone

Finalist's Name: Denton Peil

School and City: Yuma High School, Yuma CO

Sponsor's Name: Amy Melby

Category: Engineering (ENGR)

Division: Senior (9th - 12th grades)

Abstract (250 words or less):

Drones are remotely piloted aerial vehicles capable of observation, data collection, and payload delivery. Rain gutters are a feature on buildings that allow water channeling unless clogged with debris. With the issue of cleaning clogged gutters and other elevated structures, especially for those with physical ailments, could a drone be utilized to clean them while avoiding the hazards of climbing ladders or utilizing strenuous equipment for taller structures? A drone was procured and using a 3D CAD program an attachment was designed and printed with the final goal of removing the debris. The first design encompassed the entire drone anchoring on the sides, legs, battery, and the top of the drone; it utilized a long hanging brush, but this design proved too bulky to operate. A second design was adopted; this version removed the collision of the supports and utilized a remote receiver with a motor that allowed rotation of the brush. This second design proved too uncentered so it could not achieve stable flight. The next two versions removed the battery anchor point and only used clips on the legs to attach to the drone and utilized a single large brush mounted on the underside of the legs. While this version proved brittle on the clips after adjusting the design it was capable of a normal flight and landing but the brush shape was too large and the legs of the design limited the effectiveness of the brush. An optimal weight found was under 300 grams. Debris analysis pending

*I hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I also attest that the above properly reflects my own work.*

Finalist's Signature:

DENTON PEIL

Date:

3/11/2024

In addition, all students must complete the ISEF Student Checklist (1A), Research Plan, Approval Form (1B), and Checklist for Adult Sponsor (1), and any other ISEF forms required for this type of project. See the International Rules and Guidelines for form requirements. Return COPIES of all of these forms to your Regional Fair Director with you Finalist Verification/Permission Form. A signed copy of this form must be included in your notebook.