**Assembly Robot for Ultralight Handguards**
**Summer 2017**

This is an opportunity to apply modern machine design and mechatronics to create an advanced robotic machine. The objective is clear and simple - eliminate human intervention as much as possible in the assembly of a high-tech weapon component. The handguard assembly process is simple in concept - but difficult for our employees because it requires precise measurement and constant attention to detail. The benefits of choosing this project are

- Experience with detail design (i.e. the fun part) designing a robotic machine in CAD and building a functioning prototype. (we will provide specific engineering requirements)
- Potential electronics/automation in MATLAB or C++ (we can help here if you want)
- Proof to future employers you know and use modern mechatronics tools and techniques
- Experience in a unique aspect of carbon fiber composites manufacturing
- Significant interest from your industrial sponsor (we will not leave you 'out to dry')

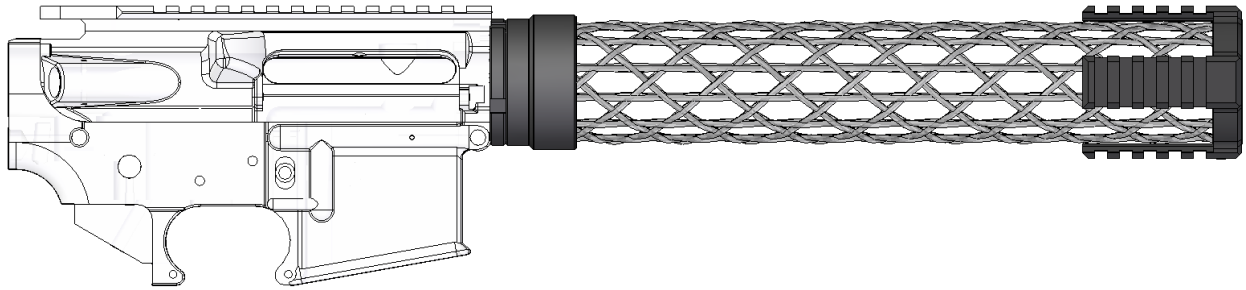
The most valuable line on your resume is your Capstone project - make sure it is something you can be proud of completing and proud to present.

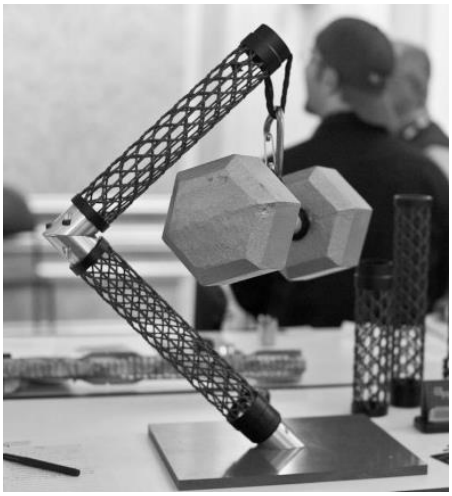
**Details**

Brigand Arms LLC is a company based in Birmingham, Alabama designing and selling ultralight braided carbon fiber handguards for AR-15 style rifles. The sizes and low-weight are an ideal component for competitive target shooting, particularly 3-Gun competitions. We have significant engineering in the handguards themselves, but still assemble the components by hand. In particular, the carbon tubes are cut to length on a wetsaw, and caps are bonded manually. The alignment of all components must be within 1/100" over a 15" part - requiring our team to manually check and recheck that all parts are square and straight. The robot will ideally eliminate as many as possible of the following steps:

1. ~~Cutting tubes to length~~ (solved by 2015 senior design team)
2. ~~Grinding ends of tube to square~~ (solved by 2015 senior design team)
3. Applying epoxy to caps
4. Inserting braided tube into cap
5. Applying epoxy between braided tube and caps
6. Force assembly into alignment
7. Hold assembly stationary during curing (20-40 minutes)

Here are some pictures of the handguard components (end-caps and tubes) and finished parts





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