

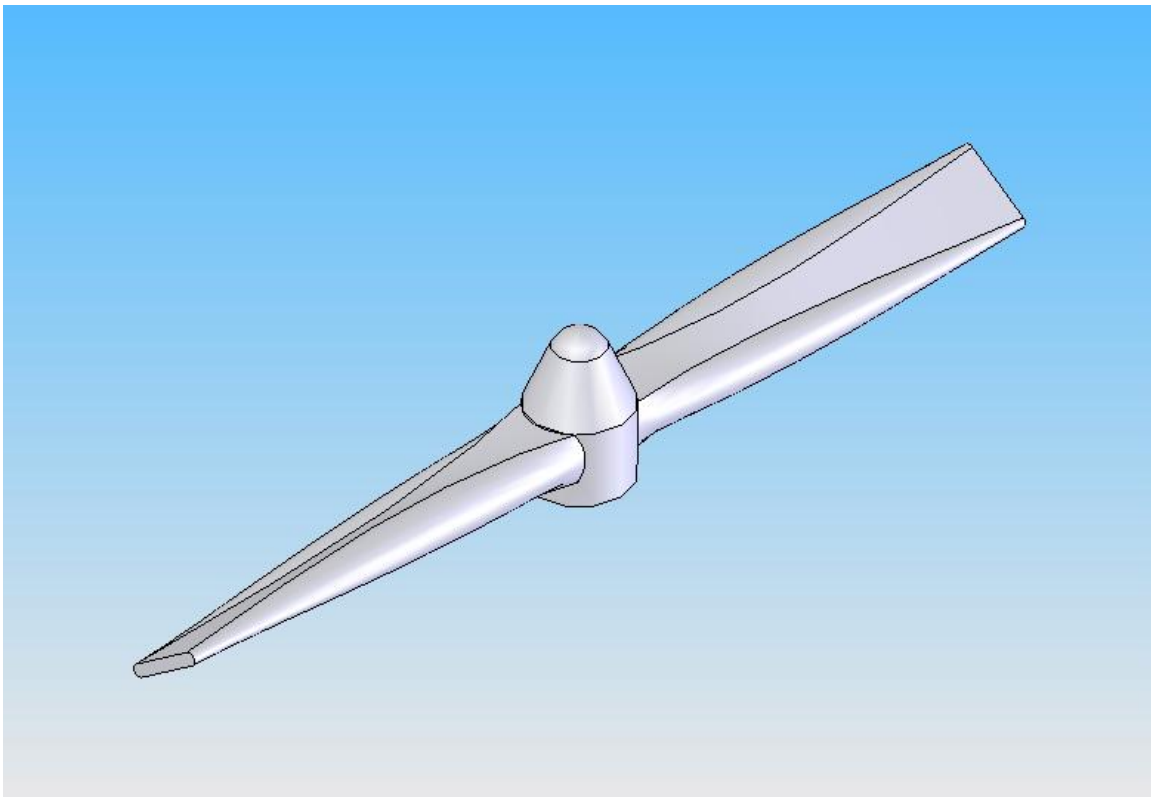
## **Manufacturing Evaluation / Budget**

Since our portion of the tidal turbine project involves the design of just the turbine blades, our costs are basically what it costs to acquire raw materials and create the turbines ourselves with the tools on campus, or how much it costs to send our design out to be created by specialized professionals.

We are currently considering two methods for creating our prototype: fused deposition modeling (FDM) or computer numerical control (CNC) machining. The necessary equipment for both options can be found on the University of Maine campus, or we could outsource.

The FDM on campus would be limited to using ABS plastic as the material, and we are concerned about the quality of the part that would be produced. We've researched a polycarbonate/ABS blend that is about 30 % stronger and costs about 10 % more than plain ABS plastic. If we decide to go with FDM, this PC/ABS blend will likely be the material that we use.

We've been able to get quotes on the cost of creating a 10" diameter turbine by submitting the dummy part seen below to various rapid prototyping companies. This part is not a realistic design in terms of blade shapes, it is simply something to get a rough idea of how much outsourcing will cost. A part similar to this (though probably with more blades) would cost around \$200 to \$300.



The University of Maine possesses 4<sup>th</sup> axis CNC machines, and one of our group members has access and experience running this equipment. If our turbine designs are able to be machined accurately enough with the machines on campus the main cost will be that of the raw material, likely aluminum. At the cross sectional size we need, this can be obtained for around \$40 per inch. The number of inches required for one model turbine isn't clear yet, though it will probably be somewhere between 1 and 3 inches. This seems to be a good option; however this would require considerably more effort on our part

Which method we decide to use will hinge upon the cost of producing a prototype, the strength of the material required, and the quality and ease of manufacture. All of these factors depend on the turbine design itself, so we won't decide on a method until we've decided on a design to test.

Many outsourcing options are available, and these examples are representative of the choices generally found.

An example FDM company:

<http://www.redeyerpm.com/Default.aspx>

PC/ABS specifications:

[http://www.redeyerpm.com/Downloads/MSpec\\_PCABS.pdf](http://www.redeyerpm.com/Downloads/MSpec_PCABS.pdf)

An example source of Aluminum:

<http://www.speedymetals.com/default.aspx>

Aluminum specifications:

<http://www.speedymetals.com/information/material5.html>