Product Specification and Project Plan

EML 4551C – Senior Design – Fall 2011 Deliverable

Team # 4

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Project Sponsor

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Project Advisor(s)

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Table of Contents

Introduction

The objective of our project is to implement electro active membrane technology to a wing (representing that used for a micro air vehicle) in an effort to improve its aerodynamic attributes. This will allow for increased maneuverability and control of the MAV, and enable it to perform in a wider range of application environments. Improving the "real time" response capabilities of the controls system is also of concern to our client, and is to be factored into our final design's specifications alongside all of our client's needs. The following are design specifications, client needs assessment, and and a projection of our intended approach throughout the project.

Product Specification

After reviewing our project description and speaking with our faculty advisor, we have received enough information to develop our product specifications. One important aspect of micro air vehicles is their dimensions. Keeping our dimensions within the boundary is crucial, so we have decided to make a single wing dimension approximately 10cm x 20cm. The wing frame itself will be made of aluminum or titanium; final decisions will be made during the building phase. Additionally, we will be using carbon grease and 3M 4910 VHB tape to act as an electric membrane over the wing. The importance of this project is to achieve a quick time response during the deformation after the voltage is applied. The overall concept in our project is to stabilize flight conditions for MAVs using these electro-active membranes.

Customer Needs

- Total Wingspan must be less than or equal to 6 inches
- Time Response of membrane from rest to full deformation
- Stabilization through gust alleviation
- Light-weight (Micro Air Vehicle)
- Membrane Deformation when a voltage is applied
- Improved response at modal frequencies (compared to previous experiments)

Quality Function Deployment

		Engineering Specifications					
		Dimensions	Voltage	Total Weight	Material Selection	Drag/Lift Coefficients	Angle of Attack(Stalling)
Customer Needs	Wingspan	Less than or Equal to 6 Inches		X	X		
	Time-Response		X		X		
	Gust Alleviation		X			X	X
	Light-Weight	X		X	X		
	Deformation		X		X	X	
	Improved Modal Frequencies		X				

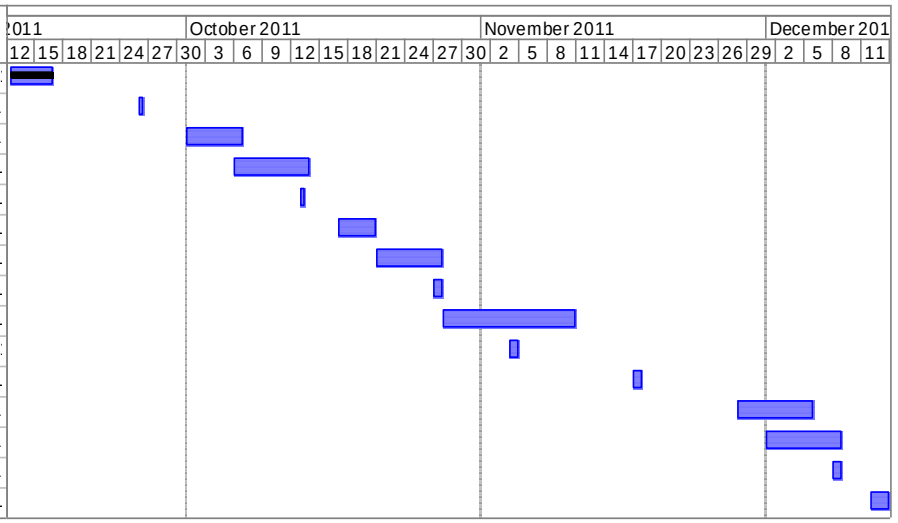
Budget

The funding for this project from Eglin is $2000. From group discussion, it has been determined that the product development and testing will not come anywhere near our limit. Research into costs of VHB tape and grease for the membrane will be under $100. Voltage source costs will vary depending on the experiment itself as well as costs for replacement batteries. The frame/structure of the wing will also present a material cost. Assuming some sort of light wood, light metal like aluminum or light plastic is used the price may vary. It is likely that material selection will be based on ease of implementation. A small amount of the budget may be used towards the trip or trips to Eglin for testing since the budget is relatively higher than our overall cost. These costs are projected to be minimal in the range of $400 to $700, which is an incredibly gross estimate. In addition, the group hopes to build a model of the MAV since there appears to be some freedom in the budget. This cost to the budget is unknown and variable based on the future design of the model/prototype.

Project Schedule

Fall Semester 2011

ID	Task Name	Duration	Start	Finish
1	Code of Conduct	4.5 days	Mon 9/12/1	Fri 9/16/1
2	1st Advisor Visit	0.5 days	Mon 9/26/1	Mon 9/26/1
3	Project Needs/ Scope	5 days	Sat 10/1/1	Thu 10/6/1
4	Product Spec/Project Plan	6 days	Thu 10/6/1	Thu 10/13/1
5	2nd Advisor Visit	0.5 days	Thu 10/13/1	Thu 10/13/1
6	Phone Meeting w/ Mentor	4 days	Mon 10/17/1	Thu 10/20/1
7	Concept Gen. & Selection	5 days	Fri 10/21/1	Thu 10/27/1
8	Present : Concept Design	1 day	Thu 10/27/1	Thu 10/27/1
9	Benchtop Testing	10 days	Fri 10/28/1	Thu 11/10/1
10	Eglin Tour / Meet Mentor	1 day	Fri 11/4/1	Fri 11/4/1
11	Present:1st Dsgn Review	1 day	Thu 11/17/1	Thu 11/17/1
12	Mentor reads Rough Draft	6 days	Mon 11/28/1	Mon 12/5/1
13	Final Design Package	6 days	Thu 12/1/1	Thu 12/8/1
14	Present : Final Design	1 day	Thu 12/8/1	Thu 12/8/1
15	Order Materials	2 days	Mon 12/12/1	Tue 12/13/1



Spring Semester 2011

ID	Task Name	Duration	Start
1	Receive Materials	2 days	Fri 1/13/1
2	Prototype Build	5 days	Fri 1/20/1
3	Prototype Testing	6 days	Sat 1/28/1
4	Data Analysis	3 days	Mon 2/6/1
5	2nd Test(If Needed)	4 days	Mon 2/13/1
6	2nd Data Analysis	3 days	Fri 2/17/1
7	Final Build	4 days	Sat 2/25/1
8	Final Testing & Analysis	6 days	Sun 3/4/1
9	Final Report & Presentation	1 day	Wed 4/18/1