

DEFN-14-001

# PROJECT DEFINITION

## APPROVALS

ROLE	NAME	SIGNATURE	DATE
Team Leader	<i>David Debeau</i>		[mm/dd/yy]
Team Leader	<i>Dat Huynh</i>		[mm/dd/yy]
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***Human Powered  
Airplane***

This document was created from template SDP-120. Contact the Mechanical and Aerospace department at the University of California, Irvine for more details.

## Revision History

REV	DESCRIPTION	DATE	APPROVED BY
A1	<i>Initial Working Document</i>	<i>2/6/2015</i>	<i>David Debeau</i>

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# 1 PROJECT OVERVIEW

## 1.1 *Executive Summary*

The Human Powered Airplane (HPA) Project at UCI is the first HPA to be designed and built in the United States in twenty years. The project was initiated by Jacqueline Thomas, UCI Aerospace Engineer Class of 2014, with the aim to create a unique design with composite construction that is easily produced and commercially viable. There have been a handful of HPA designs that flew in the past but they're typically designed as a proof of concept, with ultralight composite structures with low factors of safety. These designs often last only one flight before being discarded or put on display.

UCI's HPA is engineered for safety and reusability. The aircraft has been meticulously documented and engineered using product lifecycle management software, a first for senior design projects at UCI. This project is a true testament to UCI's strength in fostering engineering talents as it aligns learning objectives with project goals and product delivery. It blends academic fundamentals with real-world engineering. On the academic side, students have independently studied and applied aerodynamic and mechanical concepts such as lift and drag modeling, thrust modeling, propeller design, aircraft stability and control, and composite structures modeling. For real-world engineering, students learned and applied engineering and manufacturing skills such as composite structure manufacturing, mold making, flight testing, data collection and data processing.

## 2 PROJECT DETAIL

### 2.1 Project Objective(s)

Objective 1 – *Build the Aircraft*

*Design and build the Aircraft to specifications compatible with sustainable human powered flight.*

Objective 2 – *Test the Aircraft*

*Test the Aircraft before its maiden flight to confirm that it is capable of sustained human powered flight and conduct Risk Assessment.*

Objective 3 – *Fly the Aircraft*

*Fly the Aircraft and gather data regarding its performance.*

### 2.2 Scope Details

- Build two sets of propellers
- Attach Wing Skin
- Design and Build Fuselage
- Build Drive Train
- Calibrate Controls
- Assemble Aircraft
- Test Aircraft
- Fly Aircraft

### 2.3 Project Milestones

Milestone Name	Target Date	Comments
<i>Build two sets of propellers</i>	Winter Quarter	
<i>Attach Wing Skin</i>	Winter Quarter	
<i>Design Fuselage</i>	Winter Quarter	
<i>Build Fuselage</i>	Spring Quarter	
<i>Assemble Aircraft</i>	Spring Quarter	
<i>Install Drivetrain</i>	Summer Quarter	
<i>Calibrate Controls</i>	Summer Quarter	
<i>Test Aircraft</i>	Summer Quarter	
<i>Fly Aircraft</i>	Summer Quarter	

### 2.4 Steering Team

#	Name	Title	Steering Role	Email	Phone
1	Robert Liebeck	Adjunct Professor	Advisor	<a href="mailto:robert.h.liebeck@boeing.com">robert.h.liebeck@boeing.com</a>	(714) 896-1647
2	Kenneth Mease	Professor	Advisor	<a href="mailto:kmease@uci.edu">kmease@uci.edu</a>	(949) 824-5855
3	Colin Sledge	Lab Safety Manager	Advisor	<a href="mailto:csledge@uci.edu">csledge@uci.edu</a>	(970) 319-8887

**2.5 Project Staff**

#	Name	Project Role	Email	Phone	Standing	Class	Units
1	David Debeau	Co-Project Manager	<a href="mailto:ddebeau@uci.edu">ddebeau@uci.edu</a>	(916)-337-5963	Senior	189	1
2	Dat Huynh	Co-Project Manager	<a href="mailto:dvhuynh@uci.edu">dvhuynh@uci.edu</a>	(714) 386-8801	Senior	N/A	0
3	Joseph Hsieh	Chief Engineer	<a href="mailto:chiehloh@uci.edu">chiehloh@uci.edu</a>	(408) 348-0199	Senior	N/A	0
4	Nima Mohseni	Assistant to Chief Engineer	<a href="mailto:nmohseni@uci.edu">nmohseni@uci.edu</a>	(714) 728-9666	Junior	195	1

**2.6 Wing Team**

#	Name	Project Role	Email	Phone	Standing	Class	Units
1	Steven Wu	Team Leader	<a href="mailto:stevew1@uci.edu">stevew1@uci.edu</a>	(626) 340-6611	Senior	189	2
2	Edmund Situ	Team Member	<a href="mailto:esitu1@uci.edu">esitu1@uci.edu</a>	(714) 876-7450	Senior	195	1
3	Elijah Pascual	Team Member	<a href="mailto:ejpascua@uci.edu">ejpascua@uci.edu</a>	(949) 735-8632	Junior	195	1
4	Israel Cruz	Team Member	<a href="mailto:icruz1@uci.edu">icruz1@uci.edu</a>	(323) 868-5834	Senior	189	1
5	Jiufu Cai	Team Member	<a href="mailto:jiufuc@uci.edu">jiufuc@uci.edu</a>	(626) 802-7794	Freshman	98	1
6	Kelsey Safar	Team Member	<a href="mailto:ksafar@uci.edu">ksafar@uci.edu</a>	(951) 741-4026	Junior	195	1
7	Linh Ly	Team Member	<a href="mailto:linhul@uci.edu">linhul@uci.edu</a>	(909) 610-5936	Sophomore	98	1
8	Sokvuthy Chan	Team Member	<a href="mailto:sokvuthc@uci.edu">sokvuthc@uci.edu</a>	(949) 864-6399	Junior	195	1

**2.7 Fuselage Team**

#	Name	Project Role	Email	Phone	Standing	Class	Units
1	Cameron Haygood	Team Leader	<a href="mailto:chaygood@uci.edu">chaygood@uci.edu</a>	(714) 595-7574	Senior	189	1
2	David Narez	Team Member	<a href="mailto:dnarez@uci.edu">dnarez@uci.edu</a>	(626) 393-9917	Senior	195	1
3	Michael Morey	Team Member	<a href="mailto:mamorey@uci.edu">mamorey@uci.edu</a>	(805) 760-4116	Senior	189	1
4	Onalli Gunasekara	Team Member	<a href="mailto:ogunasek@uci.edu">ogunasek@uci.edu</a>	(510) 388-5448	Freshman	98	1

**2.8 Tail Team**

#	Name	Project Role	Email	Phone	Standing	Class	Units
1	Samuel Reyes	Team Leader	<a href="mailto:samuelmr@uci.edu">samuelmr@uci.edu</a>	(424) 653-4551	Senior	189	2
2	MinGeun Cho	Team Member	<a href="mailto:mingeunc@uci.edu">mingeunc@uci.edu</a>	(818) 400-6487	Senior	189	1

3	Yan Huang	Team Member	<a href="mailto:yanh6@uci.edu">yanh6@uci.edu</a>	(949) 527-1038	Sophomore	98	1
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### 2.9 Drivetrain Team

#	Name	Project Role	Email	Phone	Standing	Class	Units
1	Brian Muraoka	Team Leader	<a href="mailto:bmuraoka@uci.edu">bmuraoka@uci.edu</a>	(805) 714-9759	Senior	189	1

### 2.10 Project Costs Estimation

Project Expense	Quantity	Est. Amount (\$)
<b>Logistics:</b>		
25ft Penske Moving Truck, 3 days, 400 miles, Sales Tax, Deposit, Gas	1	\$ 975.97
<b>Launch Truck:</b>		
F150, 2WD, Running Condition	1	\$ 4,000.00
Unistrut Steel Channel 1-5/8x1-5/8 (10ft Section)	4	\$ 133.64
Unistrut Nuts 3259T117 (Pack of 5)	3	\$ 29.58
Bolts 1-1/4 94239A115 (Pack of 10)	3	\$ 15.57
Miscellaneous Unistrut Brackets	1	\$ 100.00
<b>Wing Team</b>		
Owens Corning- Foamular 150 3in thick Polystyrene (4' x 8')	5	\$ 175.00
DuPont-Mylar Rolls Clear/Polyester Film .002 48in x 100 ft.	2	\$ 100.00
Great Stuff Spray Foam	6	\$ 29.76
3M 8412 Edging and Reinforcing Tape - 1" x 72 yards roll	2	\$ 88.00
Hangar 9 heat sealing Iron	1	\$ 20.00
3fl oz. Weldwood Original Contact Cement	2	\$ 9.94
Solarfilm Balsaloc 110 gm	1	\$ 6.25
UVEX Ultra-Spec 1000 Clear Safety Glasses	10	\$ 20.43
West System 16 fl oz. Resin and 16 fl oz. Hardener 5 Minute Epoxy set	1	\$ 59.99
<b>Tail Team</b>		
Pink Foam		\$ 120.00
Fiberglass		\$ 120.00
Bagging Material		\$ 150.00
Breather		\$ 120.00
White foam		\$ 25.00
Bagging Tape		\$ 65.00
Epoxy		\$ 255.00
5 min Epoxy		\$ 60.00
Peel Ply		\$ 150.00
Gel coat		\$ 80.00
Primer		\$ 20.00

Thinner		\$	30.00
Kevlar string		\$	20.00
<b>Fuselage</b>			
Fuselage Frame		\$	500.00
Fuselage Shell		\$	400.00
<b>Propeller</b>			
Epoxy (2 gallons)		\$	300.00
<b>Drive Train</b>			
Joseph Reimbursement		\$	400.00
aluminum stock (bar, tube, plate)		\$	30.00
hardware (circlips, set screws, roll pins, shoulder bolts)		\$	35.00
thread adhesive and bearing retaining compound (Loctite)		\$	20.00
pedal cleats for Speedplay X pedals		\$	55.00
three bolt pattern road cycling shoes (Jacky probably has some already)		\$	150.00
epoxy and carbon to attach drivetrain to frame		\$	40.00
	<b>Total</b>	<b>\$</b>	<b>14,432.79</b>

### 2.11 Resource Estimation

Name	Est. Hours	Rate (\$/hr.)	Est. Total (\$)
Colin Sledge	80	40	3200
David Debeau	80	25	2000
Dat Huynh	80	25	2000
Joseph Hsieh	80	25	2000
Nima Mohseni	80	15	1200
Brian Muraoka	40	15	600
Cameron Haygood	80	15	1200
David Narez	40	15	600
Edmund Situ	40	15	600
Elijah Pascual	40	15	600
Israel Cruz	40	15	600
Jiufu Cai	40	15	600
Kelsey Safar	40	15	600
Linh Ly	40	15	600
Michael Morey	40	15	600
Min Geun Cho	40	15	600
Onalli Gunasekara	40	15	600



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Samuel Reyes	80	15	1200
Sokvuthy Chan	40	15	600
Steven Wu	80	15	1200
Yan Huang	40	15	600
<b>Total</b>	<i>1160</i>		<i>\$21,800</i>

### 3 Project Risks and Communication

#### 3.1 Risk Mitigation Plan

Risk	Severity	Probability	Mitigation
Plane Crash on Take Off	Medium	Medium	Personal Protective Equipment for Pilot
Plane Crash from Altitude	Medium	Low	Personal Protective Equipment for Pilot, Load testing for all Aircraft Components
Plane Crash on Landing	Low	High	Personal Protective Equipment for Pilot

#### 3.2 Communication Plan

Communication Type	Audience	Frequency	Responsibility
Weekly Meeting <i>Progress Reports, Engineering Change Requests</i>	All Members	Friday 4:00 PM	David Debeau, Dat Huynh
Staff Meeting <i>Design Review</i>	HPA Staff	Friday 5:00 PM	David Debeau, Dat Huynh