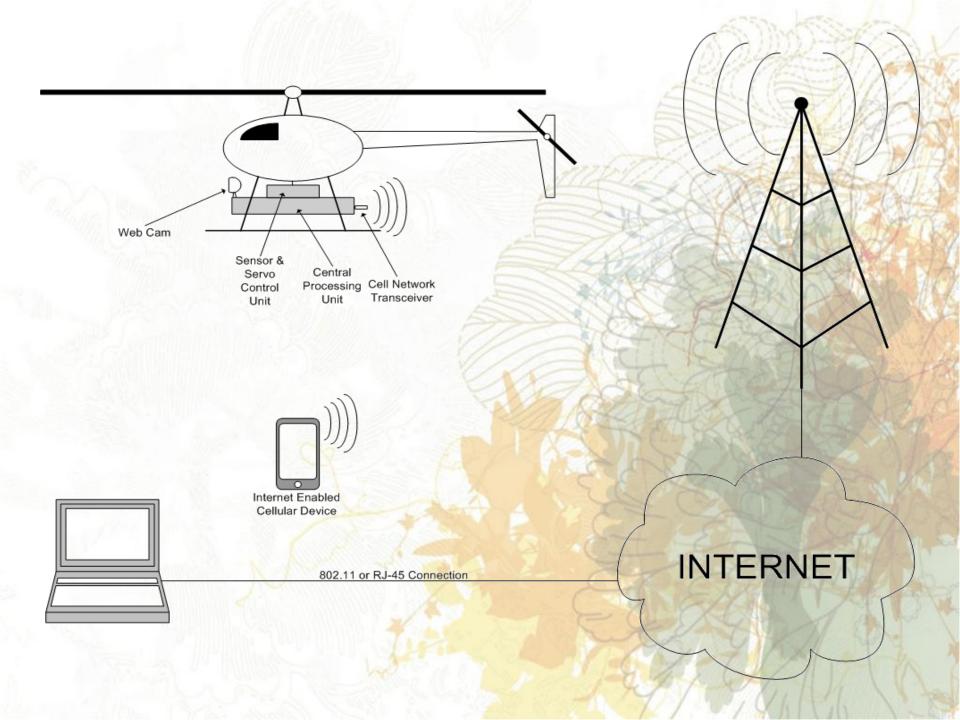
Cellular Network UAV

Nic McDonald Grant Ayers

http://pisco.flux.utah.edu/uav





ALIGN TREX 600 ESP

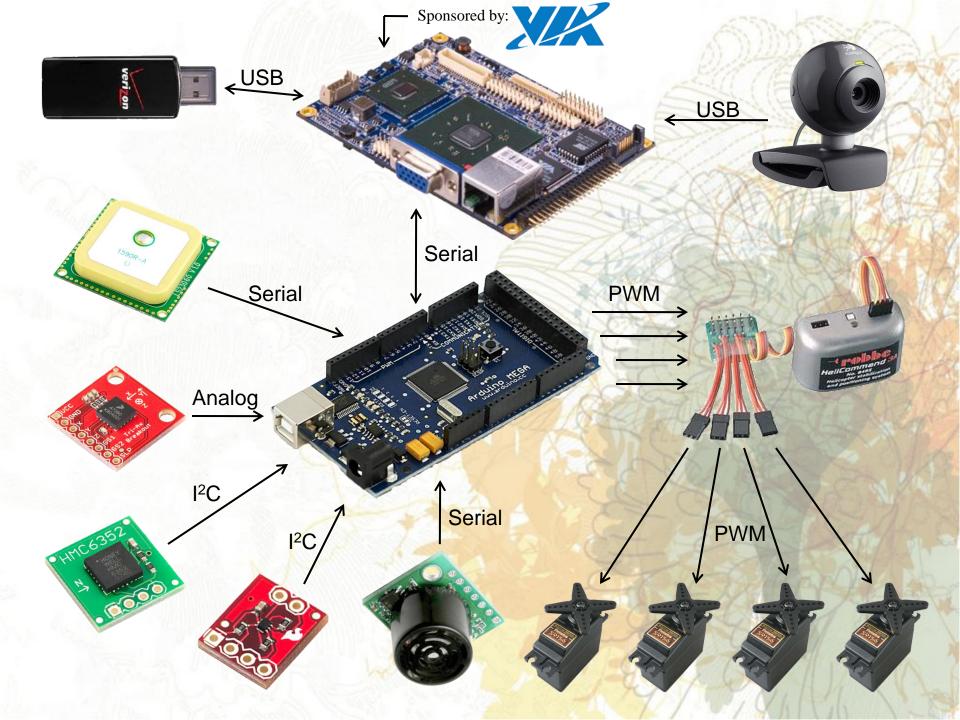
Electric Helicopter

Length: 48"

Flying Weight: 5.4 lbs.

Payload: ~3 lbs.

Sponsored by:



Private Ground Station:



- •TCP/IP command & status link.
- Manual flight control.
- •Autonomous flight control.

Public Ground Station:



- Aircraft webcam video viewer.
- Aircraft and flight statistics viewer.

Central Processing Unit:



- •TCP/IP server for command & status link.
- •TCP/IP server for webcam link.
- Main flight control system.
- Serial interface to SPU.
- USB interface to webcam.

Sensor & Servo Processing Unit:



- Command & status decoding & encoding.
- Sensor data reporting and retrieval.
- Management of sensor control (power, sensitivity, etc.).
- •Generation of pulse width modulation (PWM) for servo positioning.

Controlling a Helicopter



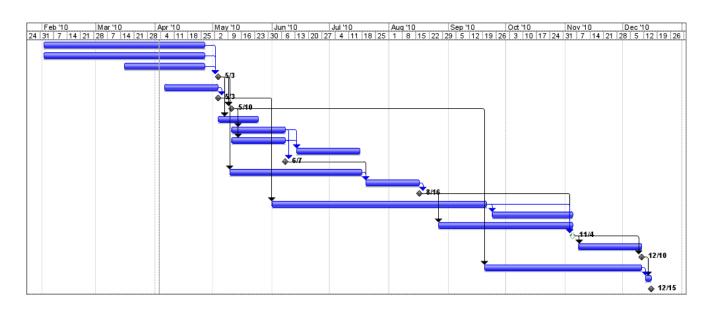
- · Elevator (cyclic pitch)
- · Aileron (cyclic roll)
- · Collective (rotor pitch)
 - · Also on tail
- Rotational velocity (RPM)
 - Tail velocity is proportional to the main rotor



Helicommand 3A Stabilization:

 Attempts to level the helicopter when the controls are 'neutral'.

ID	Task Name	Start	Finish	sh Qtr 2, 2010					Qtr 3, 2010			Qtr 4, 2010		Qtr 1, 201	
				Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1	Find a helicopter	Tue 2/2/10	Mon 4/26/10)								
2	Decide on hardware comp	Tue 2/2/10	Mon 4/26/10												
3	Order hardware	Tue 3/16/10	Mon 4/26/10												
4	All Parts Acquired	Mon 5/3/10	Mon 5/3/10				4 ,5/3								
5	Software design	Tue 4/6/10	Mon 5/3/10				a hl								
6	Software System Specified	Mon 5/3/10	Mon 5/3/10					1							
7	Project Fully Designed	Tue 5/4/10	Mon 5/10/10				5/10								
8	Interface each hardware c	Tue 5/4/10	Mon 5/24/10												
9	Initial SPU software	Tue 5/11/10	Mon 6/7/10				T	→ D							
10	Initial CPU software	Tue 5/11/10	Mon 6/7/10				_	5 4							
-11	Software improvement	Mon 6/14/10	Fri 7/16/10												
12	CPU to Servo/Sensor Link	Mon 6/7/10	Mon 6/7/10					₩ 6/7							
13	Confident helicopter manu	Mon 5/10/10	Sat 7/17/10				_								
14	Helicopter Software tests	Tue 7/20/10	Mon 8/16/10												
15	Helicopter Flies With Softv	Mon 8/16/10	Mon 8/16/10							⊕ 8/1	6		1		
16	User interface	Tue 6/1/10	Mon 9/20/10				•								
17	Improvements	Fri 9/24/10	Thu 11/4/10								T				
18	Webcam link	Fri 8/27/10	Thu 11/4/10							*		+	5		
19	Everything Finished	Thu 11/4/10	Thu 11/4/10										€-,11/4	_	
20	Final Testing and Addition	Mon 11/8/10	Fri 12/10/10										_		
21	Demo Day	Fri 12/10/10	Fri 12/10/10											12/10)
22	Write Reports	Mon 9/20/10	Fri 12/10/10								T			_	
23	Finish Reports	Mon 12/13/10	Wed 12/15/10												
24	Project Submitted	Wed 12/15/10	Wed 12/15/10											→ 12/	15



Project: UAV Date: Sat 4/3/10	Task Split Progress	Milestone Summary Project Summary	*	External Tasks External Milestone Deadline	♦ A.
		Page 1	<u> </u>		<u> </u>

Bill of Materials

Item	Description/Notes	Status	Vendor	Cost	Totals	
Vehicle:	V - 347/		=	1	T	KH L
Align Trex 600	Electric helicopter & Etc.	Got it	L-3 Sponsored	\$2,000	S. S	1 RO
Helicommand 3A	Stabilization system	Got it	L-3 Sponsored	\$500	1000	347
10/19/19				11/1	\$2,500	11
Central Processing Unit:		11		(2)	EDA	が存在
VIA ARTIGO A1000	Mini x86 System	Got it	VIA Sponsored	\$250	双形为	
1GB SO-DIMM RAM	x86 Memory	Got it	VIA	\$45		
2.5" 80GB SATA	x86 Hard drive	Got it	Newegg	\$40		
NYWASIP WILLIAM N				727	\$335	
Sensor & Servo Processing Unit:	W 407 C - 1 TO 100 C C C C C C C C C C C C C C C C C C			1		
Atmega1280	Arduino Mega	Got it	Sparkfun	\$65	XXX	No 18
	Y		VC+10	- Hall	\$65	
Peripherals:	No.			5-440		
Cell Network Modem	USB	Borrowing it	Friend	\$100	37/2	320
Logitech C200 Webcam	USB	1	Amazon	\$30	100	1-9/2
Locosys LS20031 GPS	Serial		Sparkfun	\$60	7	
Ultrasonic Range Finder	Serial, Analog, PWM	Got it	Sparkfun	\$30		P. (a)
3-Axis Accelerometer	Analog	Got it	Sparkfun	\$20		000
HMC6352 Compass	I2C		Sparkfun	\$35		233
Temperature Sensor	I2C		Sparkfun	\$6		The
ST. 1-1 DE CHE	(4000)	N N N N		9	\$281	211/
On Board Power:			700	-70		ALL
14.8v Battery	Lithium Polymer (4-Cell)	1 385 34	Hobby-Lobby	\$32	BAY Y	AF
Battery Charger	1-4 Cell LiPo Charger		Hobby-Lobby	\$30	A Do	1 3
A STATE OF THE PARTY OF THE PAR		AL AL BE	West of	7 6	\$62	80
			1 0 0		179	\$3,243

Risks

Prevention

Crash

Progressive build process. Testing, testing, testing!

Loss of link and high latency

Design aircraft software for autonomous flight. Use fail safes (timed hover and land) for complete link loss.

Interface to helicopter is only theoretically known.

Get the hardware figured out early.

Testing the interface thoroughly before flight.