Drone Conversion Appliances (DCA)

- Date: 31 March 2023
- DCA Team
- Project Advisor: Dr. Yongcan Cao, ECE
- Team Sponsor: USL Lab, UTSA
- Team Members: **Ehab Afsoonko, Conrad Obeng, Lexi McMinn, Mark James Jr., Matthew Moubray**
- “Expanding the world of Modifiable Drone Transit.”

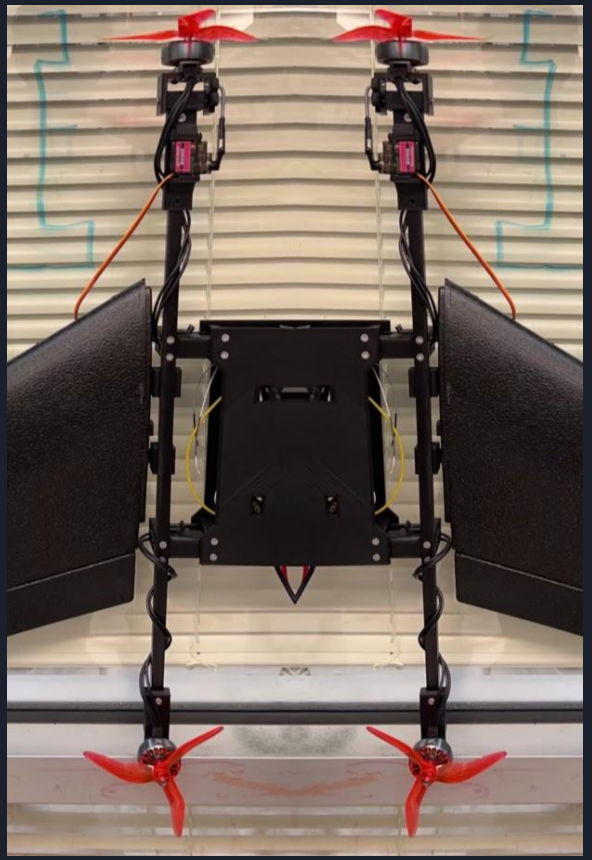
Background/Overview Slide

Every UAV, drone, or RC plane on the market is a single modality kit and constrained to a single flight pattern. Our project aims to expand the number of vehicle transportation modalities for the ModiFly Quadcopter through the addition of a VTOL Fixed-Wing module. This will allow for user to take the mainframe from the Modifly Quadcopter and attach the VTOL Fixed-Wing module without the need to purchase and build a whole entire kit. The VTOL-Fixed WIng module features are:

- Longer flight duration
- Reduced battery consumption
- Vertical-Takeoff and Landing capability
- Higher forward propulsion
- Increase payload

Tasks Completed

- Cut and drilled carbon rod booms for wing to drone attachment.
- Forward tilt and rear motor mounts designed and printed
- Drone-to-carbon rod and wing-to-carbon rod attachments designed and printed



Current Problem or Obstacles Slide

- Equal weight distribution over center of gravity of wings and forward flight.
- Incorrect servo motor ordered.
- Delayed servo motor and 7in propellers arrival.
- Tilt-motor servo-arm rod transition is not as smooth as expected and could potentially cause issues.
- Privately owned 3D printer needed maintenance and UTSA requested print request was unsuccessful due to geometry issues.

Week 24 Team Project Contribution Report

Team Name:	Drone Conversion Appliances (DCA)			
Team Number:	14			
Week Number	24			
Week Start Date:	20 Mar 2023			
Week End Date:	24 Mar 2023			
Task Number:	Task Description:	% Complete on Start Date:	% Complete on End Date:	% Progress
Task 1	Connect Motors w/ Props to Carbon Rods	85%	85%	0%
Task 2	Create Tilt-Rotor Mechanism	0%	70%	70%
Task 3	Attach Wings to Drone Base	0%	50%	50%
Task 4	Determine correct propeller size	0%	100%	100%
Team Role	Team Member Name:	UTSA ID:	Total hours worked:	Task Set
Program Manager	Conrad Obeng	fxy380	1	2
Secretary/Firmware Engineer	Ehab Afsoonko	czu525	4	3
Systems/Software Engineer	Lexi McMinn	yva363	6	3,4
Software/Robotics Engineer	Mark James jr	Eve717	1	3
Hardware Engineer	Matthew Moubray	yrb578	9	3,4

Week 25 Team Project Contribution Report

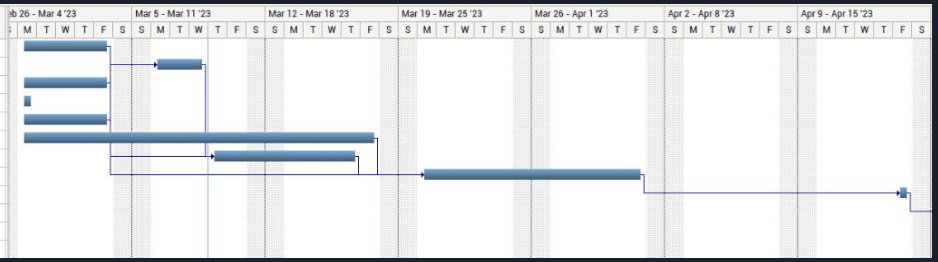
Team Name:	Drone Conversion Appliances (DCA)			
Team Number:	14			
Week Number	25			
Week Start Date:	27 Mar 2023			
Week End Date:	31 Mar 2023			

Task Number:	Task Description:	% Complete on Start Date:	% Complete on End Date:	% Progress
Task 1	Connect Motors w/ Props to Carbon Rods	85%	100%	15%
Task 2	Create Tilt-Rotor Mechanism	70%	100%	30%
Task 3	Attach Wings to Drone Base	50%	100%	50%
Task 4	Create Pixhawk-VGA wiring diagram	0%	50%	50%

Team Role	Team Member Name:	UTSA ID:	Total hours worked:	Task Set
Program Manager	Conrad Obeng	fxy380	5	1,2,4
Secretary/Firmware Engineer	Ehab Afsoonko	czu525	4	1,3
Systems/Software Engineer	Lexi McMinn	yva363	6	1,2,3
Software/Robotics Engineer	Mark James jr	Eve717	4	2,3
Hardware Engineer	Matthew Moubray	yrb578	7	1,2,3

Work Breakdown Structure

	Name	Duration	Start	Finish	Predecessors	Resources	Custom 1	Custom 2	Custom 3
1	Ardupilot Firmware Flashed	5days?	02/27/2023	03/03/2023					
2	Parameters	3days	03/06/2023	03/08/2023	1				
3	Airframe Assembeled	5days?	02/27/2023	03/03/2023					
4	Carbon Rods sized	1day?	02/27/2023	02/27/2023					
5	ESC wired	5days?	02/27/2023	03/03/2023					
6	Connect Motors to Carbon rods	15days?	02/27/2023	03/17/2023					
7	Quadcopter mode flight test	6days?	03/09/2023	03/16/2023	1,2,3				
8	Fixed Wing VTOL flight test	10days?	03/20/2023	03/31/2023	5,6,7				
9	Implement tilting of front propellers	1day?	04/14/2023	04/14/2023	8				
10	Testing parameters for forward flight	1day?	04/28/2023	04/28/2023	9				



Ongoing and Upcoming Tasks

- Combination of plane and copter ardupilot firmware, which includes the tilt motor operation and lack of tail rudder servo motor.
- Tilt motor rods
- Pixhawk to VGA adapter wiring diagram.
- Pixhawk to LiDAR installation.
- Print spacers to increase ModiFly base height to accommodate battery height.
- VTOL with wings takeoff test flight

Budget Slide

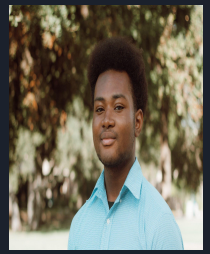
Item	Description	Cost
Pixhawk 2.4.8	Flight Controller	$150
iFlight Xing-E Pro 2207(4pcs)	VTOL Motor	~$66
HAKRC 45A 2-6S BLHeli_S 4in1 ESC	Motor ESC	$46
Turnigy Aerodrive SK3	Forward Propeller Motor	~$43.99
10x10x1000mm Carbon Fiber Rod	Carbon rods	$40

Budget Slide Con't

Item	Description	Cost
Micro Metal Gear Digital Servo Motor x4	Servo Motors	$15
4S LiPo Battery	Drone Battery	~$70
3x8mm Screws x2	Pivot Screws	$8
3mm Bolts x4	Motor Bolts	$4
3x45mm Bolts x4	Wing Mount Bolts	$7
3x20mm Bolts x4	Tilt Mount Bolts	$6
3mm Washers x8	Washers	$4
	Total Cost	459.99

Biographies Slide

- Ehab Afsnooko - Firmware Engineer - C++, Python, Verilog, embedded systems
- Conrad Obeng - Engineering Manager - Python,Drone Engineering,Drone Firmware
- Lexi McMinn - Systems/Software Engineer - C++,Python,Verilog,VHDL
- Mark James Jr. - Software/Robotics Engineer- Python,C++,Java
- Matthew Moubray - Hardware Engineer - C++, Python, LabView, eCalc, Solidworks


Questions?