

College of Engineering, Informatics, and Applied Sciences

SAE Aero Regular Class

Caleb Hatcher Damian Lumm Angel Montiel James Seganti Braden Weiler







Project Description

- To design and manufacture a Remote Control (RC) aircraft to compete in SAE West Region competition
- Fixed-wing electric aircraft with a payload to take-off, fly, and land successfully
- Stakeholders: John Tester, Sarah Oman, Northern Arizona University, Flagstaff Flyers, ASNAU
- Represent NAU in a positive manner



Design Requirements

Customer Requirements:

- Original design
- Fixed wing aircraft
- Cargo plane
- Electric motor
- Fly quarter mile loop
- Complete 4 rounds of flights
- Load/unload passengers and luggage in under a minute
- Must be able to drive and be steered on landing strip

Engineering Requirements:

- Design must be able to take off, fly, and land without components detaching
- Minimum 10 passengers (tennis balls) and 5 lbs of luggage (weights)
- 1000 Watt power limit
- Take-off within 200 ft
- Land within 400 ft



Wing

- CH10 airfoil
- 120" wingspan
- 16.36" chord
- 7.33 aspect ratio
- Removable for transportation





Iterate position to ensure it is in a flyable configuration



Fuselage

- Fast loading & unloading process (under 1 minute)
- 10 lbs of plates suspended above the tennis balls
- Accommodates 20 passengers





Propeller and Powertrain

- 400 kV motor
- 18"x8" propeller
- 4.8 kg of thrust produced
- Electronics stored in nose





Landing Gear

- Changed from tricycle to conventional landing gear (tail gear)
- Main gear mounted under wing







Tail

- NACA 0012 horizontal stabilizer airfoil
- 12.7" horizontal stabilizer chord
- Tail size and position determined iteratively using basic static stability analysis
- Design's tail volume parameter compared to other aircrafts





Performance Analyses

- Payload prediction
- Servo analysis
- Finite Element Analysis via ANSYS
- Turnigy Thrust Stand tests







Aerodynamic Analysis

- Max level velocity: 33.6 mph
- Lift off velocity: 27.5 mph
- 18.6 lb weight unloaded
- 31.2 lb weight loaded



Manufacturing

- Laser cutting
- Wood working
- Welding
- Milling
- 3D printing









Maiden Flight



Competition Results

Competition Results						
First round	Successful flight with maximum points					
Second round	Successful flight with reduced points due to skid off runway					
Third round	No flight due to electrical shortage					
Fourth round	Took flight but crashed on final turn					

Pos.	#	University	Country	Round 1 Revenue	Round 2 Revenue	Total Revenue Generated	Raw Flight Score	Normalized Flight Score
1	041	Warsaw University of Technology	Poland	\$ 6,764.25	\$ 3,382.25	\$ 10,146.50	126.8313	126.8313
2	015	Rzeszow University of Technology	Poland	\$ 3,033.63	\$ 6,053.25	\$ 9,086.88	113.5859	113.5859
3	028	Loyola Marymount Univ	United States	\$ 2,891.50	\$ 2,891.50	\$ 5,783.00	72.2875	72.2875
4	046	Ecole National D'Aerotechnique	Canada	\$ 1,833.25	\$ 2,058.50	\$ 3,891.75	48.6469	48.6469
5	045	Northern Arizona Univ	United States	\$ 2,560.00	\$ 1,279.75	\$ 3,839.75	47.9969	47.9969



Questions



