



AIAA DESIGN-BUILD-FLY 2017-2018



Project Description

Each year, the American Institute of Aeronautics and Astronautics (AIAA) releases a Request For Proposals (RFP) for the Design-Build-Fly (DBF) Competition. The competition requires students to design, build, and fly a Small Unmanned Aerial System (SUAS) to complete three flight missions and a ground mission. At the end of April, 100 teams from around the world have the opportunity to attend the “fly-off” in Wichita, KS where all missions are completed over the course of four days. The competition serves as a real-world opportunity for collegiate students to apply technical and professional skills in design, manufacturing, and testing.

Who are We?

The ERAU DBF Competition team was revamped in 2013, and is a newer team to the competition. Despite the lack of experience, the team is highly competitive. The 2017-2018 team consists of 25 undergraduate students ranging from Freshman to Senior level. The goal of our team is to develop members into successful engineers both at and away from work; hopefully we build a pretty good plane too.

Past Competitions

2016-2017:

Last year, ERAU DBF was tasked with creating an aircraft that could carry three hockey pucks and fit into a carrying tube for transport. Dimensions and weight of both the aircraft and tube were large factors of the score. Our aircraft had movable wings to accomplish the goal. After the fly-off in Tucson, AZ, ERAU DBF finished in 8th place, our highest finish yet.

2015-2016:

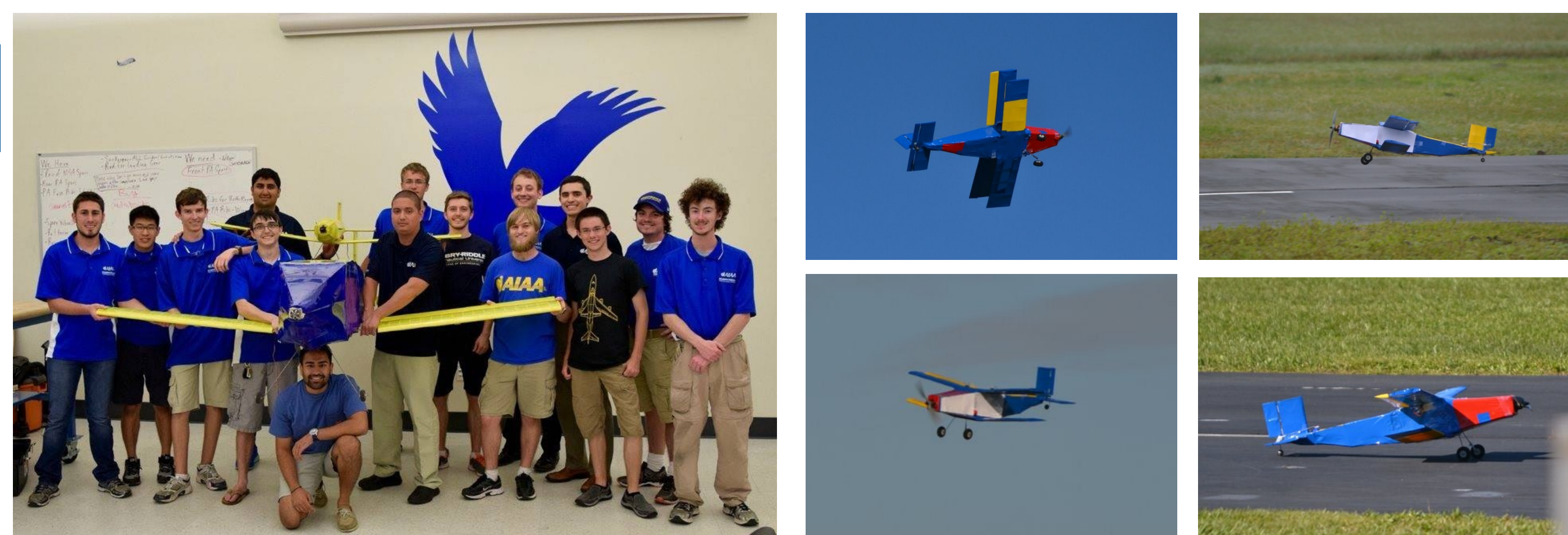
The 20th anniversary of DBF came with a challenge to create two aircraft: a production aircraft and manufacturing support aircraft. The production aircraft had to carry a full 32oz Gatorade bottle, and the manufacturing support aircraft had to carry the unloaded production aircraft internally. After the fly-off in Wichita, KS, ERAU DBF finished in 11th place.



2016-2017 Competition Plane



2015-2016 Production Aircraft



2017-2018 Flight and Ground Missions

The aircraft must complete three flight missions and a ground mission. Each mission is weighted differently and the ground mission and Mission 1 must be completed before Mission 2 and 3 can be attempted. The DBF flight course is constant every year and can be seen below.

Ground Mission:

The ground mission consists of replacing Line Replaceable Units (LRUs) within a time frame. A smaller field LRU must be replaced in three minutes, and a larger depot LRU must be replaced in five minutes.

Mission 1: Aircraft Mission Staging

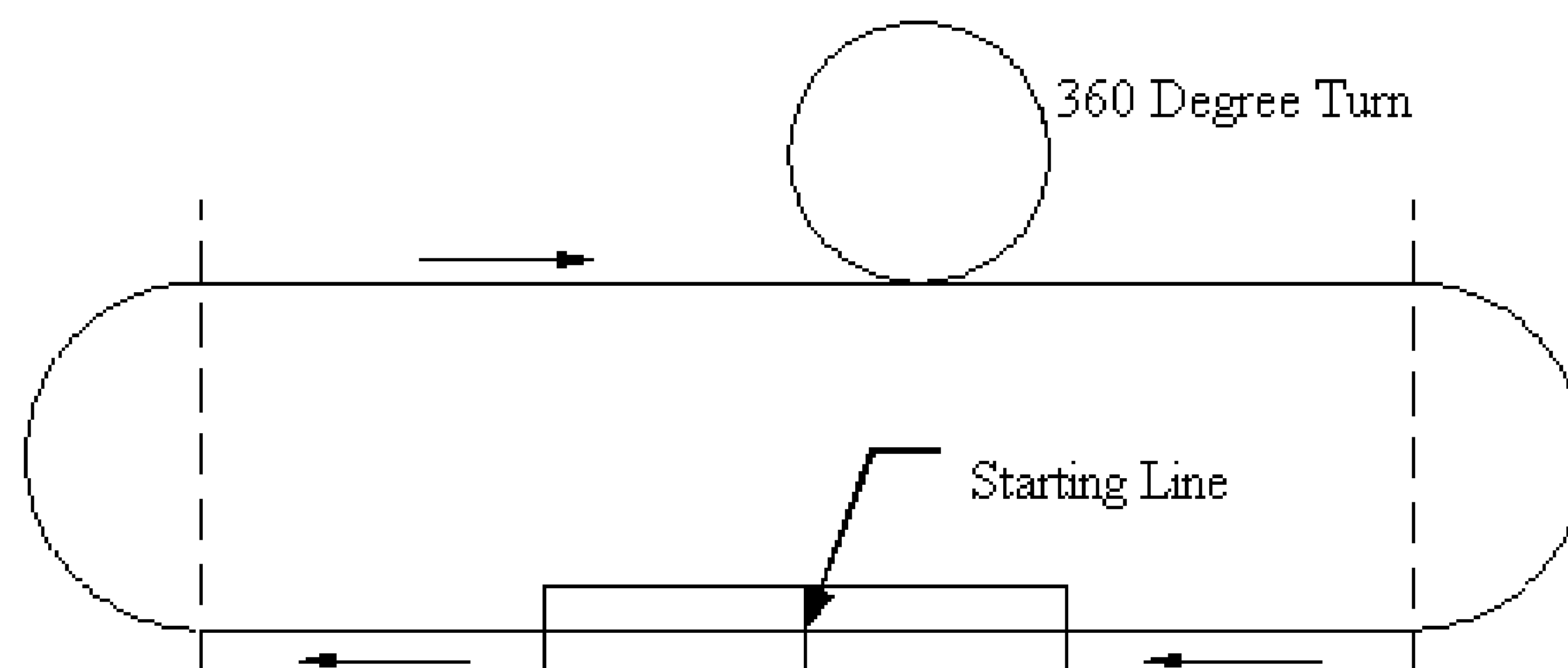
The aircraft must fly three course laps in under 5 minutes without any payload. This mission is worth one point.

Mission 2: Short Haul of Max Passengers

The aircraft must fly three course laps as fast as possible carrying as many passengers as possible. This mission is worth up to two points.

Mission 3: Long Haul of Passengers and Payload

The aircraft must fly as many laps as possible in 10 minutes while carrying as many passengers and as much payload as possible. This mission is worth up to four points.



Mission Scoring

Ground Mission = Pass/Fail

$M_1 = 1$ if Successful

$$M_2 = 2 * \frac{N_{Passengers}}{\frac{Time}{Max_{passengers}}}$$

$$M_3 = 4 * \frac{N_{Pass*Payload*Laps}}{Max_{Pass*Payload*Laps}}$$

2017-2018 Competition

This year’s competition requires ERAU DBF to build an aircraft that can carry five different sized, individually restrained “passengers” (bouncy balls) and payload blocks in two separate compartments. The aircraft also must accommodate Line Replaceable Units and has to be easily and quickly serviceable.

Total Score and Rated Aircraft Cost

Unique to the DBF Competition is the Rated Aircraft Cost (RAC). This factor is a divisor of the total score, and usually the winners of the competition minimize the RAC. This year, the RAC is a function of max Empty Weight (EW_{Max}) and perpendicular-to-fuselage Wing Span (WS). Below are the calculations for RAC and Total Score.

$$RAC = EW_{Max} * WS$$
$$Score = \frac{Report*(M1+M2+M3)}{RAC}$$

2017-2018 Progress

- Completed safety training with new members
- Determined requirements from the RFP
- Established a design matrix to maximize score
- Built multiple iterations of the aircraft
- Flight tested aircraft simulating all three missions
- Optimized wingspan and control surface sizing for stability
- Practiced replacing LRUs within provided timeframe
- Attending competition from April 19-22 in Wichita, KS

