Project Scope

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### 1.1.1 Project Description:

 The SAE Aero Design Competition involves the designing, fabricating, and testing of a radio-controlled aircraft capable of carrying a specified payload. Our team will be focusing on designing the wing and control surfaces while the other half of our team, team 507, will be focusing on the fuselage design capable of carrying the payload.

\*In this specific section there are no necessary revisions

**1.1.2 Integration Clause:**

FAMU-FSU College of Engineering will manufacture one plane that will be represented by Team 507 and Team 508. Team 508 will be the aero design team, focused on building the wing and the control surfaces and team 507 will be responsible for designing and building the fuselage. Both teams will be working together on selecting the design, using the 3-D printers, and assembling the prototype and final aircraft.

### 1.1.3 Key Goals:

 This section of the project scope lists objective oriented goals set by the design team to ensure a successful and structured final product. The final product should be mainly fabricated out of 3-D printed material, including the wings and the control surfaces. To ensure a successful design, the aero design and the fuselage teams must coordinate well to ensure seamless integration of all systems.

 The first goal for team 508 will be to estimate the wing size based on the aircraft requirements such as the aircraft's final weight. We will need to choose an airfoil profile, chord length, width, and taper.  The second goal will be designing the aircraft’s tail. Like the wing, the elevator and rudder of the tail will require an airfoil profile, length, width, and taper if necessary. The last goal in the preliminary design process will be to design and create the aileron, rudder, and elevator control surfaces to provide sufficient control of the aircraft. The control surfaces will require aerodynamic validation as well as mechanical validation of the control linkages used.

The team will coordinate with the fuselage team to assemble a scaled down version of the final design to conduct aerodynamic tests . Testing will allow team 508 to verify that the selected design can fly.

The aero and fuselage team must verify that all competition guidelines are met. This includes a weight and wingspan limit, material restrictions, and sufficient space in the fuselage to hold the size 5 soccer ball and the one pound payload.

### 1.1.4 Market:

Our product could be of interest to several organizations or individuals. The target market for our RC plane would be primarily composed of pilots of RC planes, mainly who are interested in incorporating new materials into existing RC aircrafts. Having our plane primarily made of 3-D printed material could be beneficial to the user to make repairs if the user owns a 3-D printer or has access to one.

A secondary market for our design could be the Academy of Model Aeronautics (AMA), they have several flight school programs and could be interested in acquiring a 3-D fabricated aircraft for the new RC pilots to use. The organization is always seeking to promote development of model aircraft and could be interested in an RC plane that is made almost entirely of 3-D printed material.

Companies such as Airbus, Boeing, and GE are experimenting with 3-D printed parts in their planes. These companies are interested in exploring how to incorporate new material properties in all their planes but are still unsure how to combine traditional engineering techniques with existing planes. Having a RC model airplane built out of 3-D printed material would be an innovative option to begin incorporating more 3-D printed parts into all their planes.

Another market would be the Society of Automotive Engineering (SAE), if the RC aircraft proves to be successful and is competitive with the other aircrafts that are built out of sturdier materials then SAE could use our RC plane as a standard for their future collegiate competitions.

###  1.1.5 Assumptions:

To establish a coherent timeline and a productive work environment, assumptions will be made regarding the overall design of the plane as well as how the team will function during the design process. All team members, including team 507, will have access to senior design labs and online resources for the duration of the project. With access to FAMU-FSU College of engineering senior design lab, it is assumed that the SAE Aero team will be provided with all Lightweight PLA 3D printed material as well as two working 3-D Lulzbot printers. Access to this lab also provides the Aero Team with necessary tools and hardware to establish a 3D plane prototype. This hardware provided includes a E-Flight 90 brushless motor, an Onyx 22.2V LiPo battery and a variety of servos/connecting linkages. It is assumed that the budget for the Aero Team will be equivalent to 1,000 US Dollars, this will be used to purchase necessary electrical components as well as registration fees and unforeseen project costs. To be able to compete in the 2022 SAE International Aero competition, it is assumed that the finished plane will abide by all SAE competition rules and team 508 will be registered as a verified SAE aero competitor.

* Although there are no changes in this section, it should be noted that although the team will no longer be attending the competition, they will still be abiding by all SAE competition guidelines.

**1.1.6 Stakeholders:**

Team 508’s primary stakeholders include the mechanical engineering department at the FAMU-FSU College of Engineering, our sponsor Dr. McConomy, our teaching assistant Jordan Noyes, our faculty adviser Dr. Ali, and Team 507’s adviser, Dr. Hruda. Our sponsor and our faculty advisors are contributing time, resources, and knowledge to aid their respective team. Dr. Ali will be aiding in the design process, since the primary focus of his research was on fluids/aerodynamics and will be able to guide us on which design will be the best for our team. Dr. Hruda’s focus will be on the additive manufacturing aspect, she will be helping both teams in working with the 3-D printers. Finally, the team members of both the SAE Aero (David Jay, Michael Nalovic, Sofia Rodriguez, and Tristan Wahl) and the fuselage team (Bridget Andrew, John Healy, and Alejandro Torro) are the main stakeholders, since they are investing time on research, design, and development.