

**Senior Design Project Summary
Spring 2011**

**F-1U PREDATOR
SAE BRAZIL AERO DESIGN 2012**

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The SAE Aero design project is an open challenge to engineering students and future professionals, from numerous universities, who wish to take part in the real life design of an aircraft's development. The main objective of the competition is to allow for the dissemination and sharing of technical knowledge as it pertains to the Aeronautical Engineering field.

The emphasis of the competition is the design of a cargo aircraft that should belong to one of three different categories. The current SAE Aero design competition categories are Micro, Regular, and Advanced. The current design team will concentrate in the Regular Class of the challenge. The aircraft will be remote controlled and travel through a predetermine path, it must land and takeoff within a limited runway. Points will be awarded for following all the competition parameters with an added importance to payload capacity. Initial flights would be followed by additional trials of ever increasing loads, or until the aircraft design is no longer able to perform.

The restrictions of the competition will be as followed:

- Sizing restrictions are confined to the following formula: $D = L + H + \sum_{i=1}^n B_i$

The summation of aircraft length (L), height (H), and width of all the aerodynamic surfaces (B) will not exceed 4000 and 5800 millimeters.

- 3 standard motors selections.
- Center of gravity of the aircraft must be coincident with the longitudinal center of the volume of the cargo compartment (Fuselage) $\pm 50\text{mm} / 1.968$ inches.
- Maximum width of the cargo compartment is not to exceed 400mm / 15.74 inches.
- Empty weigh of the airplane plus cargo, should not exceed 20 kg / 44lbs.
- Take-Off distance should be ≤ 50 m / 164.04 ft.

Our team will design a completely new airfoil shape, which will be created specifically for a maximum lift coefficient. In order to achieve this, the team will research airfoil inverse design techniques as well as aerodynamic optimization with the help and funding of the Ronald E. McNair Achievement program. The result of this research will allow for the design and optimization of such an airfoil. A second aerodynamic advantage will be the implementation of

whale like fin bumps to the trailing edge of many of the aerodynamic components. The addition of such trailing edge design together with a good understanding of what some previous teams accomplished in this type of competition, will serve the design team in its current challenge.

The F-1U PREDATOR SAE BRAZIL AERO DESIGN 2012 TEAM will present its design, research results and overall conclusions to the engineering board at Florida International University, in English. Another function that will be prepared is the display of all the available aircraft measuring units in both US and SI units. This will help close the gaps in the few cultural and technical differences that might be experienced during the occasion.

The goal of every engineering competition is to involve its members in the field of application, but more importantly, in the constant push of technology with ever changing tools. Our team plans on designing an aircraft with heavy use of simple CFD (computational fluid dynamics) software in order to achieve a slight advantage in flight mechanics. This practice is more important as flying speeds increase, thus the greater benefit would be to the discipline itself. This type of CFD application has enormous implications in aerodynamic research which is of tremendous importance to the efficiency of any kind of vehicle and fluid containing machinery to date; this could serve as a small step in energy independence.