GAMA/Build A Plane 2017 Aviation Design Challenge

OBJECTIVE

Congratulations! Now that you have completed the curriculum, you are ready to apply what you've learned in the program to design, build, and fly a virtual airplane—delivering the maximum payload as quickly and efficiently as possible.

RULES

Design the best airplane to deliver the maximum payload as quickly and efficiently as possible between two preselected airports. The following provides instructions and rules to successfully submit an entry for the Aviation Design Challenge:

Plane Design & Construction

- Using Plane Maker, modify a Cessna 172SP (File Name Cessna_172SP.acf) to create the best airplane for the mission.
- The mission for the design challenge score is based payload, time, and fuel consumed by the airplane to successfully complete the flight.
  NOTE: the total weight of the aircraft for this competition can not exceed the maximum allowable weight prescribed by the design.
- Key airplane design elements that you can modify are those addressed in the curriculum, such as wing shape, horizontal stabilizer, engine horsepower, etc. You may not change the efficiency (specific fuel consumption or SFC) of the engine or planet mass (mu)/gravity.
- Empty weight of the airplane must be increased/decreased by: two pounds for every square foot increase/decrease in the wing area; and two pounds for every increase/decrease in engine horsepower.

Flying the Mission

- Using X-Plane, load and configure your custom design airplane:
  - From the drop down menu, select "Location" tab to set the location to KPAE, Paine Field Snohomish County Airport in Everett, WA, on runway 29 (see figure 1, on page 3).
  - Set the desired total fuel and payload weights by selecting "Aircraft – Fuel & Weight" from the drop down menu. NOTE: maximum payload is limited to an aircraft total weight which can not exceed the maximum allowable weight prescribed by the design (see figure 2, on page 3).
  - Record a screen shot of the "Fuel/Payload" pop-up screen which must be included with your contest entry sheet (see figure 2, on page 3).
- Using X-Plane, from the Special Menu drop down select "Fly to Learn - Aviation Challenge". Read the instructions on the pop-up screen and enter the following information:
  - Departure airport ID: KPAE (Paine Field)
  - Arrival airport ID: KAWO (Arlington Municipal Airport)
  - Distance weighting power: 1.0
  - Payload weighting power: 2.0
  - Fuel weighting power: 1.0
  - Time weighting power: 1.0
- Using X-Plane, fly the competition mission:

- The timer starts when the "Fly To Learn – Aviation Challenge" window closes.
- Fly to KAWO Arlington Municipal Airport. To receive a valid score, do not run off the runway (departure or landing) and do not open any interface windows to adjust aircraft or environmental conditions. You may NOT make any changes to the weather conditions or the airplane during the mission from takeoff to landing including payload, weight & balance, fuel, etc.
- The software will calculate your challenge score based on payload delivered divided by the time and fuel consumed by the airplane to complete the mission which is a successful landing at KAWO.
- Record a screen shot of the "Aviation Challenge Score" pop-up screen which must be included with your contest entry sheet (see figure 3, on page 4).

- Judges must be able to replicate your flight using the information you provide with the design challenge contest submittal form.

JUDGING CRITERIA

The panel of judges will evaluate the following factors in determining the winner of the GAMA/Build A Plane 2017 Aviation Design Challenge (the percentage that each is worth in calculating your overall place in the competition is listed in parantheses):

1) A one-page typed summary of the design changes your team made to the airplane (20 percent)
2) A typed checklist that describes the steps the team took to make a successful flight, from take-off to landing (e.g., Did the team use flaps? If so, when? At what altitude did the airplane fly?) (5 percent)
3) Your Aviation Challenge score from the flight simulator competition software (65 percent)
4) Three videos submitted throughout the competition (10 percent)

SUBMIT

To enter the Aviation Design Challenge, each team is required to submit the following information to **STEMcompetition@gama.aero** **no later than April 21, 2017**.

NOTE: ALL documents/electronic files should include your school name in the file name.

1) A completed entry form (see Attachment A on page 5)
2) The .acf file of your custom-designed virtual airplane
3) A one-paged typed summary of the design changes your team made to the airplane
4) A typed checklist that describes the steps the team took to make a successful flight, from take-off to landing (e.g., Did the team use flaps? If so, when? At what altitude did the airplane fly?)
5) A screen shot of the "Weight & Balance & Fuel" pop-up screen prior to your challenge flight
6) A screen shotof the "Aviation Challenge Score" pop-up screen(Note: the scores must be readable)
7) A video that shows the students explaining, in their own words, what they learned during the competition, how they applied that knowledge in modifying the airplane, and how this competition has changed, if at all, their view of the aviation field and pursuing a possible career in aviation. All videos should be less than two minutes long and can be either emailed to STEMcompetition@gama.aero or can be provided via a link for download.

NOTE: All information must be submitted to STEMcompetition@gama.aero and becomes the property of GAMA, which may use it in future promotional material.

Figure 1 – Location (Select Airport)

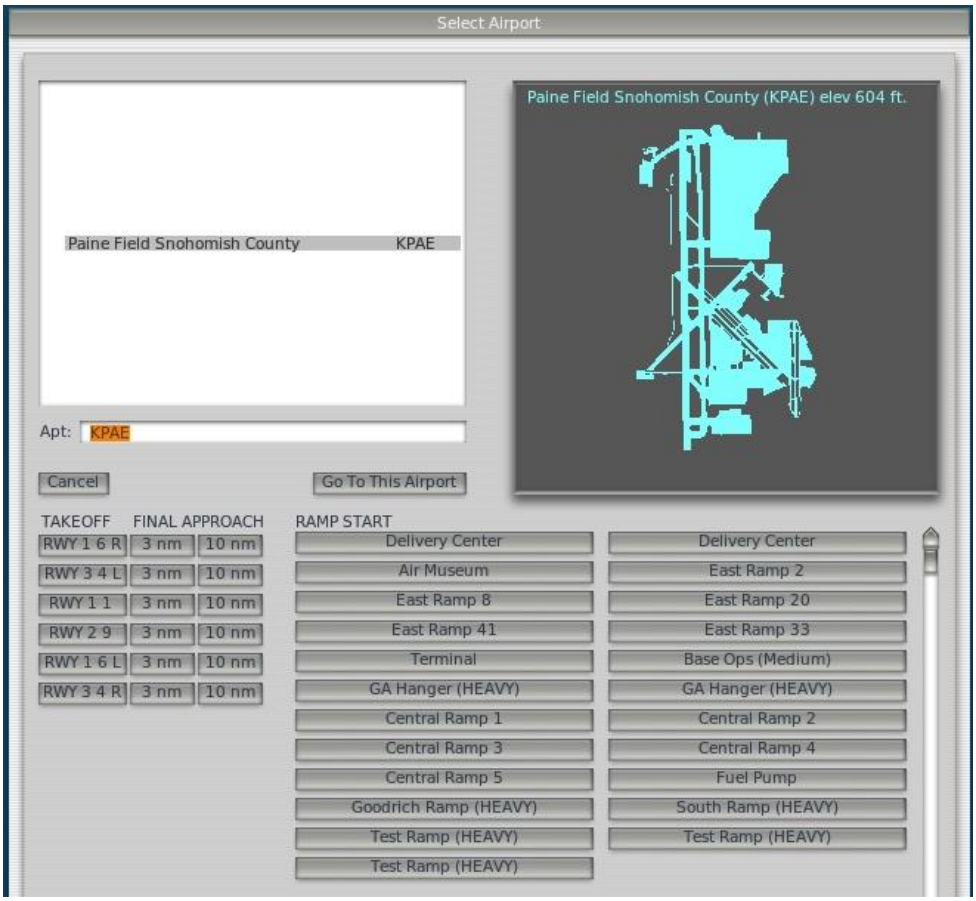


Figure 2 – Weight & Balance & Fuel

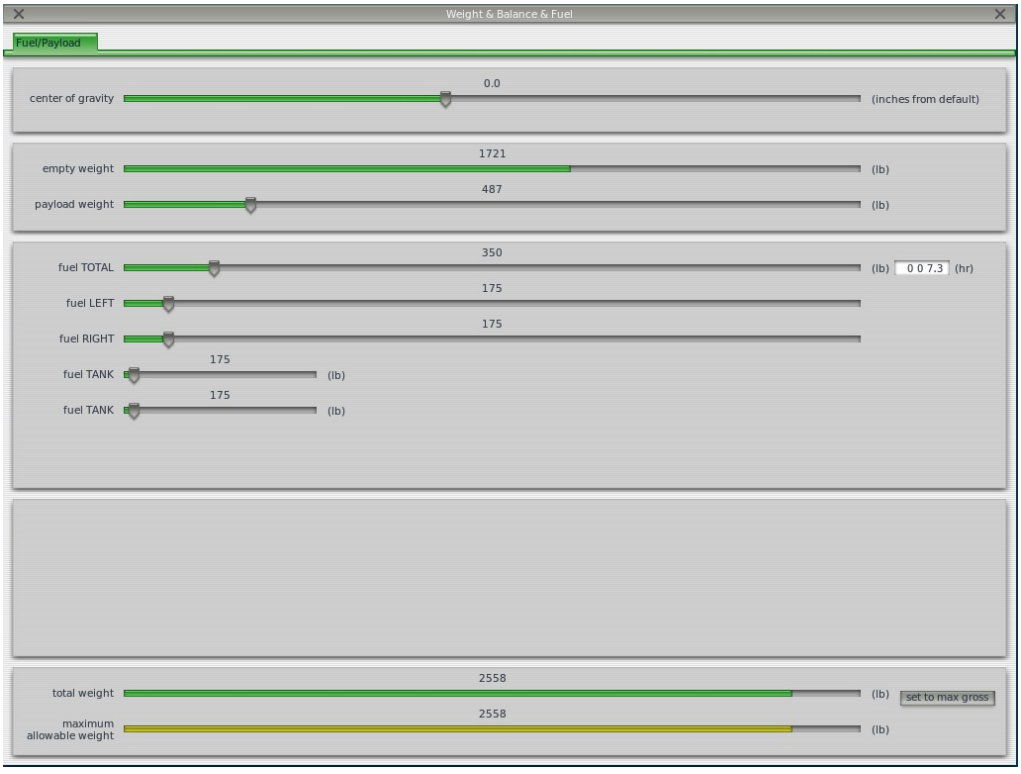
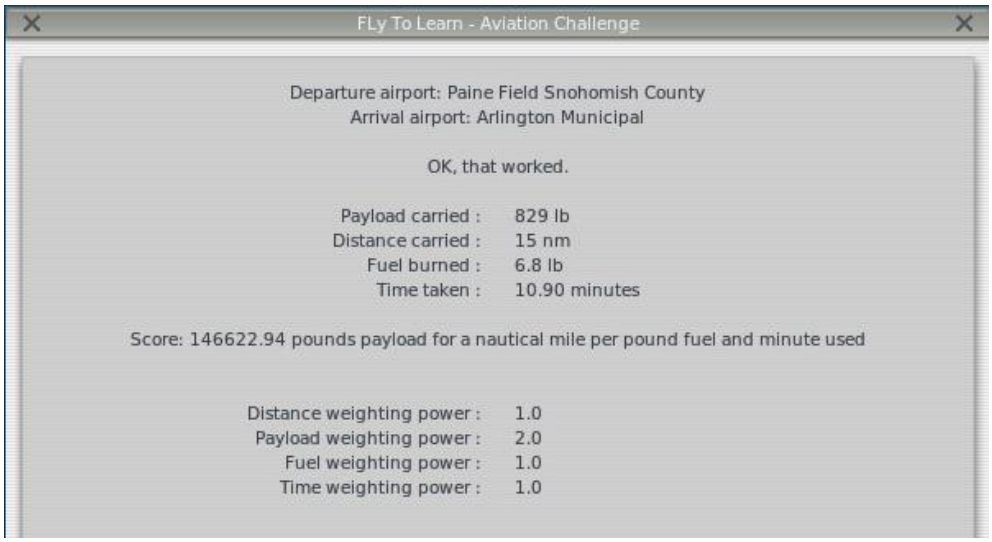


Figure 3 – Fly to Learn – Aviation Challenge (Aviation Challenge Score)



All entries are due to STEMcompetition@gama.aero no later than April 21, 2017.

ATTACHMENT A

GAMA/Build A Plane 2017 Aviation Design Challenge Entry Form

Team/High School Name:

Teacher Name:

High School City and State:

Teacher E-mail:

Name of participants (if your team is selected as the winner, please list the names and ages of the four students; substitutions are allowed until May 31, 2017):

1)

2)

3)

4)

Please list the file names of your attached documents:

ACF file of your virtual airplane:

Typed summary of your design changes:

Typed checklist describing your team's steps:

Screen shots of your airplane and score:

Send your completed entry form and supporting documents (including the video)

no later than April 21, 2017 to STEMcompetition@gama.aero.