

**Chat Transcript: Green Flight Challenge, Experts Sam Ortega and Mark Moore**  
**Sept. 15, 2011**

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**(Moderator Brooke):** Welcome to the chat! This is a moderated chat. To submit your own question, please type it in the box at the bottom of the window and click the 'Ask' button on the right side of the box. Thanks for your patience as we answer your questions.

**Sam\_Ortega:** Thank you for joining us today for our chat on Green Flight Challenge. The purpose of GFC is to promote a green aviation and advance technical innovation in personal aircraft transportation.

**Akarsh\_Valsan:** Sir, Green flights are really expensive. What are the ways to curtail down the expense of these kind of flights in under developed and developing countries?

**Sam\_Ortega:** We're supporting green flight aviation and not focusing on where it occurs. The expense of any technology is reduced with advancements which is what we are pursuing with GFC. Aerospace is inherently expensive but by developing this technology in small aircraft, the costs are reduced.

**(Moderator Brooke):** We have a lot of questions about Green Flight Challenge. Wanted to share these links periodically, very useful!

[http://cafefoundation.org/v2/qfc\\_main.php](http://cafefoundation.org/v2/qfc_main.php)

[http://www.nasa.gov/offices/oct/early\\_stage\\_innovation/centennial\\_challenges/general\\_aviation/index.html](http://www.nasa.gov/offices/oct/early_stage_innovation/centennial_challenges/general_aviation/index.html)

**Sam\_Ortega:** Competitions are effective by leveraging personal dollars spent by competitors versus signing individual contracts with each team and funding them.

**karenFly:** Hi. Does the information from these teams ever get shared with NASA?

**Sam\_Ortega:** Yes, NASA has rights to use the technology and allows the teams to pursue separate options for creating a business based on the technology they develop. Competitions permit us to work with many more people than we could work with under contractual obligations

**hsd123:** When you say green aviation, what exactly do you mean? Cleaner fuel, less sound?

**Sam\_Ortega:** The competition focuses on efficiency which is greater number of passengers per gallon of fuel consumed as well as reduced emissions for aircraft vehicles. Community noise levels are reduced as well.

**(Moderator Brooke):** Keep those great questions coming, and check out this Green Flight Challenge FAQ: [http://cafefoundation.org/v2/qfc\\_2011\\_faq.php](http://cafefoundation.org/v2/qfc_2011_faq.php)

**zmarcone:** Do you see green flights "taking off" all over the world, once the technology has been perfected?

**Sam\_Ortega:** NASA's interest in green flight is to address specific concerns in the sustainability of aviation such as global climate, noise intrusion, oil independence and all our critical US concerns for the next generation. The idea of distributed aviation solutions, such as air taxis, is an example of the new frontiers for electric propulsion and green technology.

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**zmarcone:** Are you also working on producing planes that can fly faster than the speed of sound, but be green and quiet?

**Sam\_Ortega:** Yes, but not as part of this Centennial Challenge. It is a part of NASA's fundamental aeroprogram Supersonic Project. More info will be posted during the chat with regards to this project.

**karenFly:** Sam, how does your rocket work relate to Green Flight? Or does it not really matter because you're not evaluating or judging what they do? Are there similarities in the process of developing new technologies?

**Sam\_Ortega:** My past jobs with NASA have simply prepared me for conducting the Centennial Challenges. We only have 1 challenge in work that would have any relation to my prior job with solid rocket motors and that is the NanoSat Launcher.

**(Moderator Brooke):** *Do you have a question you've been waiting to ask? Go for it! To submit your own question, please type it in the box at the bottom of the window and click the 'Ask' button on the right side of the box. Thanks for your patience as we answer your questions.*

**dannyfuzzywuzzy:** Has anyone used solar cells on the outer skins of planes yet?

**Sam\_Ortega:** Yes, some examples are Sun Seeker and Solar Impulse. These are very slow vehicles because solar cell efficiency to produce their power still needs further advancement.

**dannyfuzzywuzzy:** Does GFC include alternative fuels that come from crops, or other sources that traditional jet fuel?

**Sam\_Ortega:** Biofuel and electric aircraft are all entrants in GFC. The exciting thing about electric is that they are 3 times more efficient than conventional hydrocarbon fueled aircraft.

**(Moderator Brooke):** *More information about the Supersonics Project can be found at the Fundamental Aeronautics Web site: <http://www.aeronautics.nasa.gov/fap/index.html>*

**dannyfuzzywuzzy:** Where do carbon fibers fit into reducing weight of aircraft? Like reducing the amount of weight of wiring by using thinner, lighter electrical circuits. Less total aircraft weight is one way to increase the number of passengers per gallon of fuel consumed!?

**Sam\_Ortega:** Yes, you are correct. Lower weight improves efficiency and carbon fiber yields lower weight structures. What is critical is to achieve the best combination of structural efficiency, propulsion efficiency and aerodynamic efficiency.

**AkarshValsan:** Why do flying planes with bio fuel freeze at high altitudes and what is "Gimmick"?

**Sam\_Ortega:** Biofuels get slushy at colder temperatures and the higher you go, the colder it gets. New formulation of biofuels have additives that can reduce and/or prevent this phenomena and are being further developed.

**karenFly:** Did any of the requirements include number of passengers; i.e., how big might some of these aircraft be?

**Sam\_Ortega:** The rules allow a team to have 1 gallon of gas or gas equivalent per passenger. The gas equivalent for electricity is 33.7 kilowatt hours. There is one team that plans on flying a 4 passenger aircraft. The only limit on the number of passengers is the gross weight limit of the scales available for the competition which was 6500 pounds.

**zmarcone:** How are the planes going to be supplied with electricity? (solar panels, etc.)

**Sam\_Ortega:** Santa Rosa, Ca., where the competition is being held is a showcase city for green energy. 95% of their electricity is from geothermal electric power stations, solar power stations, and wind power stations. Comparative Aircraft Flight Efficiency (CAFE) -- the coordinators of this challenge -- have installed the world's first electric charging station at the Sonoma County airport. This premier world's first charging station was funded by the CAFE Foundation.

**Akarsh\_Valsan:** Dear Sir, Greetings from Akarsh Valsan ,India. How do you think history played a significant role in Human Green Flight?

**Sam\_Ortega:** Aviation Prize awards have long been offered and have played pivotal roles in the formulation of aviation advancements. The Orteig Prize, as an example, motivated Charles Lindbergh to pioneer long distance flight.

**Sam\_Ortega:** The GFC has similar potential to create an epiphany for high efficiency flight.

**dannyfuzzywuzzy:** One day we may very well see electronic circuits made of carbon fibers, embedded in composite aircraft body structures. Like why not imbed the carbon fibers inside fore/aft structural members of a plane to combine structural strength with electronic circuits that are needed?

**Sam\_Ortega:** The concept of multi-functional structures is an exciting area of investigation at NASA across space and aeronautics. This will permit smart materials to be far more capable than current dumb structures. For example, the ability to understand what loads are being carried through structures real time would allow us to adjust the structural loading to best meet the current conditions, just like a bird does.

**dannyfuzzywuzzy:** The same technology that will allow cars to become electric will also help with the powering of aircraft. Ways to store electric power, batteries, are one of the next BIG break-thrus in electric power technology! Batteries are typically heavy; so how do we get weight out of batteries, and yet make them store a lot of energy? This is a very important answer to come up with!?

**Sam\_Ortega:** GFC addresses the improvements of aircraft performance, efficiency and noise. The Centennial Challenges have an additional challenge starting later this year which is focused on improving the efficiency of energy storage systems. This challenge will be called Night Rover and more info will be posted in a moment.

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**micky:** what's is green flight challenge?

**Sam\_Ortega:** More information for Green Flight Challenge [http://cafefoundation.org/v2/gfc\\_main.php](http://cafefoundation.org/v2/gfc_main.php)

**(Moderator Brooke):** Also, more about the Night Rover Challenge: <http://www.nightrover.org/>

**Guest:** The challenge involves small aircraft - what about the airliners most of us fly on?

**Sam\_Ortega:** We're developing technologies that can be scaled up and applied to all types of aircraft. The first step is to understand the fundamental physics of the improvements before applying them to a larger scale and that is what GFC hopes to achieve.

**zmarcone:** What are some current designs that are being developed?

**Sam\_Ortega:** <http://blog.cafefoundation.org> has great postings with regards to designs and technology being developed for green aviation. This blog addresses much more than just the GFC. The CAFE Foundation is dedicated to fundamental research of green aviation advancements.

**karenFly:** Mark, your bio mentions Puffin and other type of aircraft. Are there any attributes of those aircraft that you hope to see in the competition designs?

**Sam\_Ortega:** Electric propulsion is one characteristic of the radical change in the designs for green flight that several entrants are pursuing. NASA has investigated multi-fuselage span loading concepts previously. One of the entrants is pursuing this approach. This is a very effective way of achieving a minimal structure weight

**zmarcone:** When do you expect (approximately) that we'll see large green passenger planes? (what year)

**Sam\_Ortega:** NASA and Boeing have been investigating electric subsonic commercial transport for the NPlus3, 30-year time frame. An internet search of Boeing Sugar Concept will provide more information on this technology.

**(Moderator Brooke):** *We're extending the chat for another 15 minutes or so, in order to answer more of these great questions, so ask now!*

**dannyfuzzywuzzy:** Again, the most amount of energy that is wasted during flight could very well be the friction of air over the skin of the aircraft! So by reducing the friction of airflow over aircraft skin, a lot of wasted energy is NOT wasted. I would think that anyone who competes in the CFG would have to develop a lower friction outer aircraft skin!?

**Sam\_Ortega:** Yes. One way to do this is to achieve extensive laminar flow instead of the typical turbulent flow. This can achieve up to a 60% reduction of drag. Wiki laminar versus turbulent flow for more information

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**zmarcone:** How will these green planes be mass produced? (current airline companies, etc.)

**Sam\_Ortega:** We don't know. We develop technology and allow private market place to develop the most efficient manufacturing processes for their products.

**Akarsh\_Valsan:** Usage of Bio-fuels and Alternate Fuels are really eco-friendly. But are they powerful as synthetic fuels.

**(Moderator Brooke):** Per an earlier answer from Sam, here's a link to more about NPlus3:

[http://www.boeing.com/Features/2010/06/corp\\_envision\\_06\\_14\\_10.html](http://www.boeing.com/Features/2010/06/corp_envision_06_14_10.html)

**Sam\_Ortega:** Synthetic fuels, biofuels and hydrocarbon fuels can all achieve similar heating values thus the real value behind bio and alternate fuels is their reduced carbon footprint. The key question still exists on how to produce them at a competitive price point. Batteries currently have a significant deficiency in terms of an equivalent heating value per mass.

**Sam\_Ortega:** Thank you all very much for your participation today. Stay tuned to <http://www.nasa.gov/challenges> as well as the previously noted CAFE Foundation website for updates to the Green Flight Challenge as it is conducted during the last week of September.

**(Moderator Brooke):** Thanks Sam and Mark for the great answers to everyone's questions. We appreciate your taking time out of your day to sit down with us. Our chat is over, but a transcript will be available within a few business days. Have a great afternoon.