



Invitation and announcement
for the
GREEN SPEED CUP 2019
Rev. 01

28.12.2018

1 Intentions

The GREEN SPEED CUP is an aviation competition focusing on efficient flight. The emphasis lies on the fast and energy saving transportation. The competition is meant to develop new methods to reduce energy consumption of motor driven aircraft using technology and/or atmospheric energy sources like lateral winds and updrafts. In making the ability of certain aircraft and techniques transparent, the competition shall set new standards in general aviation.

Furthermore it is platform to discuss the topic among pilots who are interested in energy efficient flight and change experiences. In the end the most important aspect of the contest is to enjoy flying and be curious of a new kind of energy efficient ways to fly.

2 Host

Green Aviation Institute e.v.
Münzstraße 15
10178 Berlin
Germany

3 Location and time schedule

The competition is being held on the Strausberg airfield (EDAY).

Arrival + Opening:	08.06.2019
1. Day of competition (Afternoon):	08.06.2019
Last day of competition:	10.06.2019
Closing ceremony and departure:	10.06.2019

4 Tasks and competition

4.1 Tasks

According to 7.1 WBO mainly speedtasks with predefined waypoints will be flown. The length of the each task depends on the competition class and the current weather and goes to a maximum of 150 - 500 km for combustion engines and 50 – 100km for electric

driven aircraft. To prove practical suitability of electric aircraft, the task might include 1 – 2 touch and gos.

In case of bad weather one day can be changed into a precision landings competition.

Every task comes with a minimum energy consumption.. Different minimum energy consumptions are used for combustion and electric aircraft.

Class definitions

All aircrafts¹ are allowed in the following classes:

- **Electric - Class**

- Electrical driven aircraft
- All aircraft with one to four seats
- Up to 2700 kg (MTOW 5950 lbs)
- *actual task distances depend on competitors and their abilities*

- **Combustion - Class**

- Aircraft with combustion engines (piston or turbine)
- All aircraft with one to four seats
- Up to 2700 kg (MTOW 5950 lbs)

Hybrid aircraft are allowed to choose their class. The energy consumption is the sum of the electric energy used and the fuel used.

Hybrid aircrafts participating in the combustion class are allowed to charge their batteries only by using the aircraft internal generator. External charging is forbidden.

Hybrid aircrafts participating in the electric class are allowed to charge their batteries by the aircraft internal generator or from the grid. The charging will be supervised and included in the overall energy consumption.

4.2 Taxi

All taxiing on the ground will be done under the power of the onboard engine².

4.3 Takeoff and departure

Takeoff will be done solely under own power. The contestants will be briefed and have to take off within a certain period of time. All competitors will take off in short order and the time will be taken when passing the starting line. The interval of time between take off will be determined by the competition administration.

¹ For aircrafts that are unable to take off under own power a winch launch is available. For one winch launch an energy penalty equivalent to 0,5 liter diesel fuel ($0,5\text{l} \times 0,8\text{kg/l} \times 12,87\text{kWh/kg} = 5\text{kWh}$) will be added on the energy consumption achieved.

² For aircrafts that are unable to taxi under own power an energy penalty equivalent to 1 liter regular fuel ($0,72\text{kg/l} \times 12,55\text{kWh/kg} = 9\text{kWh}$) / (1.35 kWh for electric aircraft) will be added on the energy consumption achieved.

4.4 Order for takeoff

The order for takeoff of the first day in competition will be drawn. The order of the following days will be according to the ranking from the previous day in the particular class. The order can be changed by the competition administration to increase flight safety (different climb and flight speeds of competitors).

4.5 Flight

For every leg of each flight a minimum altitude will be given by the competition administration. This altitude will typically be between 500ft and 3000ft GND. Going below this altitude will be punished according to 5.2.

4.6 Score

The ranking will be calculated for each class. For information purposes an overall ranking, including all classes, will also be displayed.

4.6.1 Scoring within classes

The calculation of the GSC-Points will be done according to the GSC-formula normed to the best of each class. Therefore the winner of each day in completion will earn 1000 Points and the rest will get points in relation to this 1000 Points.

The GSC-formula is the ratio of average speed divided by the total energy consumption multiplied with a "seat coefficient". This is a factor depending on the number of available seats in the aircraft. It is a way to level the differences between these aircraft and their profile. The following coefficients will be applied:

0,9 – Single seat

1,0 – Double seat

1,2 – Four seats

Two and four seat aircraft must be loaded with minimum 50kg on the pilot and copilot seat.

$$\text{Green Speed Cup Points} = \frac{\text{average Speed} \left[\frac{\text{km}}{\text{h}} \right] * \text{seat coefficient}}{\text{Energy consumption [kWh]}}$$

A minimum energy consumption for every aircraft is calculated from the distance of the task multiplied with a factor F. This minimum energy consumption will be used in the formula above when the contestant uses less or equal to this amount on the given task. For F the following values apply:

Combustion – Class: F = 0,1 kWh/km

Electric – Class: F = 0,015 kWh/km

$$\text{minimum energy [kWh]} = \text{Distanc [km]} * F [\text{kWh/km}]$$

4.6.2 Overall ranking

An overall ranking will be generated. It will be determined from the sums of the daily rankings.

4.7 Flight documentation

4.7.1 Track

The pilot is responsible for the complete documentation of competition flights and the correct functioning of his GNSS-recorders. A valid IGC-certification is necessary. The time interval between two GNSS fixes may not exceed four seconds. Recommended is one second in the proximity of the start line, the finish line and inside turn point sectors.

The logged files shall be saved on a data carrier (USB-Stick, SD Card, micro-SD Card) and handed to the scoring office. The logged file shall be an IGC-file with a security key. The original files are to be kept at least until the briefing of the following day.

If there is more than one file from the competition day (for example in the event of a restart), those files have to be submitted to the scoring office directly and immediately.

Every Pilot is responsible for the proper functioning of his GNSS-System.

In case of a malfunction of the primary system, secondary not IGC-certified recording systems (e.g. FLARM) will be accepted. Possible software and connecting cables need to be provided.

4.7.2 Energy consumption

The fuel consumption on a flight will be determined by the difference in weight of the aircraft (in a particular condition) before and after the flight. The dumping of water ballast can therefore not be considered.

From used fuel, the energy consumptions can be determined, using the calorific value of the fuel. For the conversion the following table will be used.

Fuel	Calorific value [kWh/Kg]*
Diesel	12,87
Gasoline	12,55
JET-A1	12,94

* According to the research report Nr. 170375 of the Swiss Federal Environmental Agency.

The energy consumption of electrical driven aircraft will be determined using an electric meter on the recharge of the batteries. Solar cells may be used to lower energy consumption.

4.8 Outlandings

Outlandings are landings on areas/airfields, where the specific type of aircraft is not permitted to land. In case of an outlanding the flight will be scored with 0 points.

Landings during the task on airfields or areas where the aircraft is allowed to land will NOT be prosecuted, but the time of the task will continue until passing the finish line.

4.9 Approach

The approach can be flown with or without engine power. The time of the task stops when flying into a cylinder with a radius of 5 km (~2,7 NM) around the finish. Flying into the cylinder can only be done from above minimum height for the last leg. A sideways entry will be prosecuted according to 5.2. A Landing within the cylinder is considered an outlanding (4.8), if it is not on the designated finishing airfield.

4.10 Competition area and charts

The competition area extends over parts of Germany which are covered by the ICAO maps Rostock, Berlin and Nürnberg.

4.11 Publication of flight records

The participants agree to the publication of the data and results gathered and recorded on the ground and in the air throughout the competition. Also the results of each competition day as well as an overall ranking will be published. The competitors agree that any recorded data may be used for scientific publications.

5 Regulations

5.1 General

The competition is based on the regulations of the German "Segelflug-Wettbewerbsordnung (SWO) 2004-AN5" of the DAeC from the 15. April 2009 or following revisions.

Furthermore all revisions of the Sporting Code, Section 3, Class D, of the FAI issue 1999-AL8 apply. Constraints by ATC, authorities as well as the daily briefings are binding. Local procedures might be applied and will be announced during the opening briefing.

5.2 Breach of rules and airspace violations

Penalties will be given according to article 10 WBO:

- Leaving the competition airspace either vertically or horizontally will be prosecuted with 50 penalty points per started minute outside of the competition airspace. The competition airspace will be defined by the competition administration during the briefing and ends for example:
 - At the minimum or maximum altitudes for each day in competition defined by the competition administration
 - At the borders of airspaces or restricted areas
 - At the border to airspace C or D (in some cases)

Furthermore the competition authorities can penalize additional infringements against rules or flight safety. For the penalty the *Sporting Code Annex A, chapter 8.9* will be consulted.

Dangerous flying and ignoring safety instructions:

- Minimum: 50 penalty points
- Maximum: Disqualification for the day
- To hinder the departing or arriving traffic or handing in the flight documentation too late: 50 penalty points
- Intentionally exceeding the allowable loading / maximum take off mass: min. 200 penalty points
- Exclusion or disqualification of one or more days in competition (e.g. multiple or major airspace violations, compromising air traffic safety)
- Admonition when disregarding instructions by competition authorities

5.3 Objections and complains

The procedures and rules for objections and complains will be handled according to 10.3 und 10.4 WBO. According to 10.5 WBO objections or complains against pre-known rules are not admissible.

When filing an objection, the initiator has to pay a **fee of 100 €** (deviant from the WBO). The money will be paid back, if the jury decides that the objection is reasonable. The decision regarding an objection will be made within 24 hours. All deadlines are limited on the last day of competition and expire at midnight of that day.

6 Requirements for participation

The requirements for participation at the GREEN SPEED CUP are for:

a) Pilots:

- A valid Medical (for use in Germany)
- A valid pilots license and an approval to fly the corresponding aircraft
- A valid Radiotelephony certificate
- Paid entry fee
- The acceptance of the announcement and the competition rules

b) Aircraft:

- a valid permit (airworthiness certificate and aircraft registration)
- a liability insurance,
- at least one IGC-Logger according to 4.7

7 Registration

The registration for the GREEN SPEED CUP requires an e-mail to info@green-aviation-institute.com with the following information:

1. Name of pilot
2. Type of aircraft
3. Registration number
4. Type of logger

8 Confirmation of registration

The approval to compete at the GREEN SPEED CUP will be sent via e-mail at the latest by May 30th 2018 and is binding for competitor and aircraft. Subsequently a refund of the registration fee is not possible anymore. The organizer might

- Limit the number of aircraft within the competition
- Cancel the competition if not enough participants registered or other reasons make this step necessary

9 Fees

The registration fee can be obtained from the website. Copilots can be changed without further fees.

The registration will be effective, when the fee has been transferred onto the GSC bank account. The bank details will be given in the confirmation of registration.

Further fees (landing fees, parking fees and camping fees) will be billed at the end of the competition.

10 Radiotelephony

A certified Radio shall be on board during every flight in the competition. The frequency in use will be:

Departure/Approach: 123,050 MHz

11 Languages

The official competition language is German. For Briefings and other statements English will be used if necessary. If in doubt the German wording will be the reference.

12 Accommodation and catering

Accommodation and catering during the competition will be arranged. The Airport restaurant "Doppeldecker", as well as the nearby canteen (only open on workdays), are suitable possibilities. Furthermore, accommodation can be provided by the "Gasthof Strausberg Nord", „The Lakeside Burghotel zu Strausberg“ or in the airfield quarters.

13 Liabilities

By handing in his/her registration, the participant/responsible pilot declares that he/she waives all claims for damages against the organizer and the sponsor as well as against their institutions and agents, except in the case of damage caused intentionally or by gross negligence. This waiver will not apply to the extent and amount that an insurer will accept and settle a claim. In addition, the participant declares on behalf of himself/herself and his/her team that all items of the regulations contained in the announcement will be acknowledged. Should the participant take part in the competition with an aircraft he/she does not own, the owner of the aircraft declares that he/she has been briefed on the announcement/implementing regulations and declares his/her consent to the limitation of liability concerning any damage to his/her aircraft. For minors, a signature of his/her legal representative is required. The right to take legal action is excluded.

At any time the pilot in command is responsible to comply with the applicable air laws and to operate the aircraft within its limits, especially within its maximum loading and takeoff weight.

14 Cancellation of the event

The host

The organizer reserves the right to cancel the event if the event does not reach the necessary minimum number of participants at least 2 weeks before the start of the event. In cases of force majeure, which not only make the performance of the event more difficult, but also impracticable, the organizer reserves the right to cancel the event at short notice.

If an event is canceled due to insufficient number of participants or for other reasons, the participants will be informed immediately and the registration fees already paid will be refunded immediately.

Reimbursement of uselessly incurred travel expenses and other expenses, in particular accommodation costs, will only take place if intent or gross negligence on the part of the organizer or of the persons to whom it has served led to the failure of the event. In no case will there be a refund of hotel costs or cancellation costs for hotel rooms.