



FAI Sporting Code

*Fédération
Aéronautique
Internationale*

Section 4 – Aeromodelling

Volume F5 Radio Control Electric Powered Motor Gliders

2023

Effective 1st January 2023

- F5B - RC ELECTRIC POWERED MULTI TASK GLIDERS
 - F5J - RC ELECTRIC POWERED THERMAL DURATION GLIDERS
 - F5A - RC ELECTRIC POWERED GPS GLIDERS (Provisional)
 - F5E - RC SOLAR POWERED MOTOR GLIDERS (Provisional)
 - F5F - RC 6 CELL ELECTRIC POWERED MOTOR GLIDERS
(Provisional)
 - F5G - RC ELECTRIC POWERED BIG MOTOR GLIDERS (Provisional)
 - F5K - RC THERMAL DURATION GLIDERS FOR MULTIPLE TASK
COMPETITION WITH ELECTRIC MOTOR AND AMRT
(Provisional)
 - F5L - RADIO CONTROLLED THERMAL GLIDERS RES WITH
ELECTRIC MOTOR AND AMRT (Provisional)
- ANNEX 5 E - RULES FOR WORLD CUP EVENTS

*Maison du Sport International
Avenue de Rhodanie 54
CH-1007 Lausanne
Switzerland
Tel: +41(0)21/345.10.70
Fax: +41(0)21/345.10.77
Email: info@fai.org
Web: www.fai.org*

FEDERATION AERONAUTIQUE INTERNATIONALE
MSI - Avenue de Rhodanie 54 – CH-1007 Lausanne – Switzerland

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1 FAI Statutes, Chapter 1, para. 1.6
2 FAI Sporting Code, Gen. Section, Chapter 4, para 4.1.2
3 FAI Statutes, Chapter 1, para 1.8.1
4 FAI Statutes, Chapter 2, para 2.1.1; 2.4.2; 2.5.2 and 2.7.2
5 FAI By-Laws, Chapter 1, para 1.2.1
6 FAI Statutes, Chapter 2, para 2.4.2.2.5
7 FAI By-Laws, Chapter 1, paras 1.2.2 to 1.2.5
8 FAI Statutes, Chapter 5, paras 5.1.1, 5.2, 5.2.3 and 5.2.3.3
9 FAI Sporting Code, Gen. Section, Chapter 4, para 4.1.5
10 FAI Sporting Code, Gen. Section, Chapter 2, para 2.2.
11 FAI Statutes, Chapter 5, para 5.2.3.3.7
12 FAI Statutes, Chapter 6, para 6.1.2.1.3

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VOLUME F5

SECTION 4C – MODEL AIRCRAFT – F5

– ELECTRIC POWERED

Part Five – Technical Regulations for Radio Controlled Contests

- 5.5 Electric Powered Motor Gliders
- 5.5.1 General Rules
- 5.5.2 Contest Rules
- 5.5.4 Class F5B - RC Electric Powered Multi Task Gliders
- 5.5.11 Class F5J - RC Electric Powered Thermal Duration Gliders

Provisional Classes

- 5.5.3 Class F5A - RC Electric Powered GPS Gliders
- 5.5.7 Class F5E - RC Solar Powered Motor Gliders
- 5.5.8 Class F5F - RC 6 Cell Electric Powered Motor Gliders (for juniors and seniors)
- 5.5.9 Class F5G - RC Electric Powered Big Motor Gliders
- 5.5.10 Class F5K - RC Thermal Duration Gliders for Multiple Task Competition with Electric Motor and Altimeter/Motor Run Timer (AMRT)
- 5.5.12 Class F5L - RC Thermal Gliders RES with electric motor and AMRT

Annex 5E Rules for World Cup Events

THIS 2023 INCLUDES THE FOLLOWING AMENDMENTS MADE TO THE 2022-V2.0 EDITION

Paragraph	Plenary meeting approving change	Brief description of change	Change incorporated by
F5B	2022	Early implementation – effective 1st June 2022	Tyson Dodd Technical Secretary
5.5.4.1 j)		Changed the definition to include allowed electronic systems.	
F5J		Early implementation – effective 1st June 2022	
5.5.11.12 n)		Added a clarification to Scoring (sub-paragraph <i>n</i>) to eliminate the possibility of negative scores. Scoring programs will need to be updated.	
F5L		New Provisional Class	

THIS 2022-v2.0 EDITION INCLUDES THE FOLLOWING AMENDMENTS MADE TO THE 2022 CODE

2022 and 2020 amendments are marked by a double line in the right margin of this edition

Paragraph	Plenary meeting approving change	Brief description of change	Change incorporated by
F5B	2022	Early implementation – effective 1st June 2022	Tyson Dodd Technical Secretary
5.5.4.1 j)		Changed the definition to include allowed electronic systems.	
F5J		Early implementation – effective 1st June 2022	
5.5.11.12 n)		Added a clarification to Scoring (sub-paragraph <i>n</i>) to eliminate the possibility of negative scores. Scoring programs will need to be updated.	

Paragraph	Plenary meeting approving change	Brief description of change	Change incorporated by
There were no changes at the 2021 Plenary Meeting			

Four-Year Rolling Amendments for Reference			
Paragraph	Plenary meeting approving change	Brief description of change	Change incorporated by
F5 General Rules	2020		Kevin Dodd Technical Secretary & Emil Giezendanner F5 S-C Chairman
5.5.2.1 a)		Deleted and replaced the definition of an Official Flight.	
5.5.1.3, 5.5.1.5 c), 5.5.1.6, 5.5.2.6.		Removed references to F5D.	
F5D		Class was moved to F3 Pylon	
5.5.6		Removed the complete F5D Section	
F5J			
5.5.11.10 e)		Specified a time of 3 seconds for which the glider must fly straight ahead after launching.	
F5K (new class)		Thermal Duration Gliders For Multiple Task Competition With Electric Motor And Altimeter/Motor Run Timer (AMRT)	
5.5.10		New rules for this class.	
Annex 5E		Rules for Electric Flight World Cup Events	
5E.2.1		World Cup competitions for F5B and F5J to be held every year.	
5E.2.4		Introduced a World Cup Coordinator	
5E.3.1		Increased the number of contests to be counted in the case of more than 20 WC contests.	
5E.3.2		Increased the number of contests to be counted in the case	

		of countries with more than 2 time zones.	
5E.3.3		Introduced a new table of points.	
5E.3.4		Introduced the possibility of separate classifications for Juniors and Women.	

Paragraph	Plenary meeting approving change	Brief description of change	Change incorporated by
Front Page Contents Throughout	2019	Change the name of the volume and update list of classes on the front page and consequently in all other parts of the volume. Remove F5D from list of classes but retain F5D rules until June 2020. Remove F5K.	Kevin Dodd Technical Secretary & Emil Giezendanner F5 S-C Chairman
F5A		F5A – Electric Powered GPS Motor Gliders	
5.5.3		Add new provisional class, F5A – Electric Powered GPS Motor Gliders, and rules.	

F5E	2019		
5.5.7		Revise the title of the class and completely revise the rules.	
F5J			
5.5.11.1.1		Clarification regarding an exception to the F5 general rule 5.5.1.3 d) for F5J.	
5.5.11.1.3		Additional rule to allow the possibility of a motor restart in World Cup and Open International events.	
5.5.11.6		Clarification to re-flight rule.	
5.5.11.8.1		Addition to team protection rule for junior pilots.	
5.5.11.10		Early implementation – effective 15th May 2019 Amendment to Safety Rule for launching	
5.5.11.11		Addition to landing rule, giving the contest director more flexibility in setting landing direction	
5.5.11.12		Change of terminology 'truncated' instead of 'rounded down'.	
F5K		Class was deleted	

Paragraph	Plenary meeting approving change	Brief description of change	Change incorporated by
F5B	2018		Kevin Dodd Technical Secretary & Emil Giezendanner F5 S-C Chairman
5.5.4.1 b)		Reduce the minimum weight of the battery pack.	
F5J			
5.5.11.2 b)		Early implementation – effective 1st June 2018 Add provision for a team manager and assistant team manager to help competitors.	
5.5.11.8.1 c)		Early implementation – effective 1st June 2018 Clarification regarding team protection – mandatory at Cat 1 events.	
5.5.11.13	Early implementation – effective 1st June 2018 Specify the method of national team classification		

Paragraph	Plenary meeting approving change	Brief description of change	Change incorporated by
There were no changes at the 2017 Plenary Meeting			

RULE FREEZE FOR THIS VOLUME

With reference to paragraph A.10.2 of CIAM General Rules:

In all classes, the two-year rule for no changes to model aircraft/space model specifications, manoeuvre schedules and competition rules will be strictly enforced. For Championship classes, changes may be proposed in the year of the World Championship of each category.

For official classes without Championship status, the two-year cycle begins in the year that the Plenary Meeting approved the official status of the class. For official classes, changes may be proposed in the second year of the two-year cycle.

This means that in Volume F5:

- (a) changes to F5J can be next agreed at the Plenary meeting 2023 for application from January 2024;
- (b) changes to F5B can be next agreed at the Plenary meeting 2022 for application from January 2023;
- (c) provisional classes are not subject to this restriction.

The only exceptions allowed to the two-year rule freeze are genuine and urgent safety matters, indispensable rule clarifications and noise rulings.

VOLUME F5

PART FIVE – TECHNICAL REGULATIONS FOR RADIO CONTROLLED CONTESTS

5.5. CATEGORY F5 – ELECTRIC POWERED MOTOR GLIDERS

5.5.1 GENERAL RULES

5.5.1.1 Definition of Electric Powered Motor Gliders

Model aircraft in which lift is generated by aerodynamic forces acting on surfaces remaining fixed in flight except control surfaces and which performs manoeuvres controlled by the pilot on the ground, using radio control, or by rotating surfaces in case of helicopters. The power pack for the electric motor may not have any fixed connection to the ground or another model aircraft in the air. Recharging of the power pack during flight by solar cells is permitted.

5.5.1.2 Builder of the Model Aircraft

There is no requirement for the competitor to be the builder of the model in F5. Refer C.5.1.2. in *CIAM General Rules*.

5.5.1.3 General Characteristics of RC Electric Powered Motor Gliders F5

Maximum total area 150 dm²

Maximum weight 5 kg

Loading 12 to 75 g/dm²

- a) The power source shall consist of any kind of rechargeable batteries (or secondary cells), the maximum no load voltage must not exceed 42 volts. In case the voltage is measured, this shall be done at the moment the preparation time for the pilot starts. After the measurement has been taken, the pilot is allowed 5 minutes preparation time as per 5.5.2.4.
- b) Battery specifications in F5B and F5J are written in the special rules of these classes. ||
- c) Mechanical or chemical modification of the individual cells, e.g. to reduce their weight, is not allowed except that insulation sleeves of individual cells may be changed.
- d) Electronic systems allowed are:
 - Augmented stability systems.
 - Systems that limit the energy used during climbs.
- e) Electronic systems that are prohibited are:
 - Autonomous or pre-programmed flight.
 - GPS or similar positioning systems or waypoint navigation.

Further exceptions are written in the specific class rules.

5.5.1.4 Energy Limiter/Logger

The energy limiter/logger is located in the electric circuit between the battery and the motor. In the case of a limiter, the interruption must persist for a defined period of time. Logger data must be retrieved immediately after the flight. The contest organiser may supply a "real time radio telemetry logger" that transmits logged data to the ground. The energy data and motor-run data shall be made available to the pilots.

5.5.1.5 Procedure for Limiter and Logger Checking

The limiters and loggers must be approved by the EDIC (ELECTRONIC DEVICES IN COMPETITIONS WORKING GROUP).

- a) The general procedure of limiter and logger checking follows Section C.12, Model Processing, in *CIAM General Rules*.
- b) The organiser will check if the limiter/logger is correctly connected to RX, LiPo pack and ESC. There must not be any type of "jumper" present in the RX cable or on the current sensor.

c) **Malfunction of limiter/logger:**

- limiter/logger given by the organiser, the competitor will have a reflight.
- limiter/logger of the competitor, a penalty in F5B/F of 100 p must be given.

Only one of these two systems can be used at a contest. The organiser must decide which of these two systems he will use and indicate clearly in the invitation.

5.5.1.6 Number of Model Aircraft

The competitor may use two model aircraft and three in F5J. The competitor may combine the parts of the model aircraft during the contest, provided the resulting model aircraft conforms to the rules and that the parts have been checked before the start of the contest.

5.5.1.7 Competitor and Helper

Each competitor must operate his radio equipment personally. Each competitor is permitted two helpers and the team manager.

5.5.2 CONTEST RULES

5.5.2.1 Definition of an Official Flight

- a) During a two (2) minute starting period, the competitor is allowed an attempt which starts when the model aircraft is released by the competitor or his helper. After two minutes, no further launching or take off is allowed and the flight is scored with 0 points. The pilot may repeat a second two minute starting period only if:
- b) The competitor cannot perform a flight due to outside interference verified by the organiser.
- c) No scoring was made for reasons outside the control of the competitor. In such cases, the flight may be repeated at any other time decided by the Contest Director.

5.5.2.2 Cancelling of a Flight and Disqualification

The flight is annulled:

- a) If the pilot uses a model aircraft that does not conform to the FAI rules. In the case of intentional or flagrant violation of the rules, in the judgement of the Contest Director, the competitor may be disqualified.
- b) If the model aircraft loses any part during the flight time. The losing of a part during landing (ie. contact with the ground or another obstacle) during the flight due to a collision with another model is not taken into account;
- c) If the model aircraft was already used by another competitor at the same contest;
- d) If the pilot uses more than two helpers;
- e) If any part of the model aircraft does not come to rest and remain at rest within 100 metres from the landing spot. For powered gliders, this rule applies only after the duration and landing task has started.
- f) If for powered gliders the duration and landing task has not been started and also the landing does not occur on the designated flying side of the security line and within 100 m from the intersection of that line with Base A or B.
- g) If in contrast with the declaration of the competitor the model aircraft carried more than the allowed number of cells as power source for the motor or the voltage exceeds 42 volts.
- h) The competitor is disqualified if the model aircraft is controlled by anyone other than the competitor.
- i) If the model aircraft touches either the competitor or his helper during landing manoeuvres, no landing points will be given.
- j) If an infringement of energy limitation rules occurs the result of that round is discarded.

5.5.2.3 Organisation of the Contest

For transmitter and frequency control see C.16.2 in CIAM General Rules.

The official in charge will issue the transmitter to the competitor only at the beginning of his preparation time, according to 5.5.2.4.

5.5.2.4 Organisation of Starts

The competitors shall be combined in groups, in accordance with the radio frequencies used, to permit as many flights simultaneously as practical. The combination is organised in such a way that, as far as possible, there are no pilots of the same nation or team in one group. The flying order of different groups is also established in accordance with the frequencies used. The competitors are entitled to five minutes of preparation time before they are called for the start.

5.5.2.5 Processing of Energy Limiters

The organiser of an event has to provide power supply equipment for energy limiter processing. The competitor must have the ability to check his limiters prior to and during the contest.

5.5.2.6 Judging

The organiser must appoint a panel of at least three judges of different nationalities who are selected from the official CIAM Judges List.

Note: These General Rules and Contest Rules are applicable to the F5 Class: Multi Task Gliders (5.5.4.)

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5.5.3.5 Distance Task

- a) The competitor is free to switch on or off the motor.
- b) The flight direction for the distance task will be given by CD.
- c) The model airplanes have to cross line A in a time window of 180 sec after the start.
- d) The task begins when model aircraft has crossed line A the first time.
- e) Every completed leg from line A to line B will be awarded with 200 points.
- f) The second leg will start when the model crosses again line A in direction of line B. etc.
- g) The distance task ends when working time of 900 sec stops. The loss of any part of the aircraft must stop the distance task, too (landing 5.5.3.6 b will count).

5.5.3.6 Landing Task

- a) Additional points will be awarded for landing; when the model aircraft comes to rest in the 20 m circle: 200 points. 100 points will be given while coming to rest in the 30 m circle. The distances are measured from the centre of the circle to the nose of the model aircraft.
- b) If the model comes to rest two minutes after working time no landing points will be awarded.

5.5.3.7 Contest organisation

- a) Flying in groups of 2 to 6 competitors depending of the number of competitors. Team composition must be changed for every round. If possible only one competitor of the same team.

5.5.3.8 Scoring

- a) The winner of each group will be awarded with 1000 points per round.
- b) If two or more competitors in a group will have the same number of completed legs, the competitor with the highest average speed gets the 200 points. The competitor with the lowest speed gets 100 points. All others between.
- c) The total score consists of the number of legs, plus landing minus amount of consumed energy over 1000 W*min (points legs XX + points landing m – points W*min = total score).
- d) A minimum of two and a maximum of 6 flights must be flown. If more than 1 (one) flight is flown, the lowest score of each competitor will be discarded.

ANNEX of F5A GPS Glider Rule

Available electronics and software

Vario and GPS loggers: SM GPS Logger 2 (Jeti Duplex, Multiplex M-Link, Graupner HoTT, Futaba, JR DMSS, FrSky, with Adapter for Spectrum) www.sm-modellbau.de

Receivers: RC electronics RC T3000 (<http://www.rc-electronics.org/>), FLYMATE (www.flymate.ch)

Software: SkyNavigator (skynavigator.ch) must be adapted for F5A

5.5.4 CLASS F5B – RC ELECTRIC POWERED MULTI TASK GLIDERS

5.5.4.1 Definition

- a) Definition: This contest is a multi-task event for RC Electric Powered Multi Task Gliders including two tasks:

- 1) Distance
- 2) Duration and landing

These two tasks are executed without interruption in one flight. A minimum of two and a maximum of 8 flights must be flown. If more than three flights are flown, the lowest score of each competitor will be discarded.

- b) Model Aircraft specifications:

Minimum weight without battery	1000 g
Minimum surface area	26.66 dm ²
Type of battery	Any type of rechargeable batteries
Maximum number of equivalent cells in series	At any point in the flight, the maximum voltage of the flight battery must not exceed 42 volts.
Minimum weight of battery pack	400 g

The maximum amount of energy to be used in one flight is 1750 W*min. Anything over this will result in a deduction of 1 point per 3 W*min over 1750 W*min.

The amount of energy in one flight must be stored by a logger.

- c) Loggers can be provided by the event organisers and will be drawn by the competitor before the flight. If loggers are provided by the organisers then this is the logger that will be used by the competitor for the flight/event.

Once drawn, the competitor will have at least 15 minutes to fit the logger into the plane(s).

Immediately after landing, the W*min consumed will be read from the logger which was used during the flight, either by means of telemetry or direct cable connection to the logger.

- d) The competitor must return the logger(s) after their flight - max 15 minutes.
- e) The competitor is responsible for ensuring the logger device is installed correctly. In the event of an installation failure the competitor will not receive a reflight.
- f) The organisers will check each logger prior to it going out to a new competitor to ensure that it is in full working order.
- g) With the logger, 1 (one) point is deducted for every 3 (three) watt-min used over the limit.
- h) Starting order for World and Continental Championships: the starting order for the first round will be established by random draw. For the next rounds the starting order will follow the reversed ranking list. Frequency will not follow frequency and team member will not follow team members.
- i) Starting order for other competitions:

Before starting the first round the contest director will inform the pilots which mode of starting order will be established.

Mode A:

The starting order for the first round will be established by random draw.

The number of pilots is then divided by the number of rounds giving "x" result.

For each subsequent round, the first number "x" of pilots in the starting order moves to the end of the starting order

Example:

Given that there are 24 pilots and four rounds then the calculation results in 6.

The starting order for the rounds would then be as follows:

- Round 1: Starting order 1-24.
- Round 2: Starting order – the first six pilots move to the end of the starting order which is now 7-24 and 1-6.
- Round 3: Starting order – the first six pilots move to the end of the starting order which is now 13-24 and 1-12
- Round 4: Starting order – the first six pilots move to the end of the starting order which is now 19-24 and 1-18.

Mode B:

The starting order for the first round will be established by random draw.

This starting order will be used for all subsequent rounds except for the last round.

For the last round the starting order will follow the reversed ranking list.

- j) In addition to rule 5.5.1.3 d) the following **electronic systems** are allowed:
 - Any kind of telemetry that is not prohibited by rule 5.5.1.3 e).
 - Systems that log the energy used during climbs.
 - Variometer.

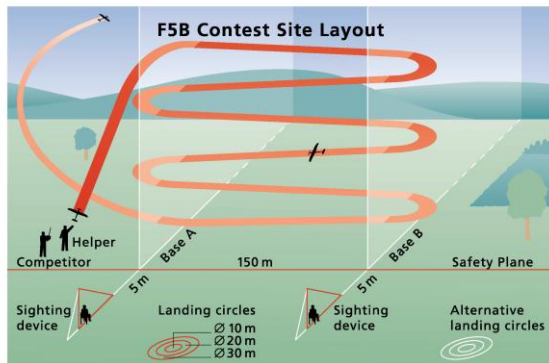


5.5.4.2 Course Layout and Organisation

- a) Two imaginary vertical planes at a distance of 150 m from each other determine the turnlines and are named Base A and Base B. A safety plane is established perpendicular to these planes. The safety plane is endless. The sighting devices used to detect the crossing of the Bases A and B are placed at a minimum distance of 5 m from the safety plane outside the course.
- b) For landing, the organiser must provide three concentric circles 30, 20 and 10 m in diameter, or a tape or line with marks at the same distance, located at a place on the field where no danger of collision exists with model aircraft simultaneously flying either the distance.

5.5.4.2 F5B Contest Site Layout

Base B can either be to the left or right of Base A.



5.5.4.3 Scoring

- a) For each flight the total score is compiled by adding the partial score A and B for each competitor;
- b) The individual result of each round is normalised to the points of the best competitor of that round.

$$P \text{ round} = 1000 \times \frac{\text{Individual points}}{\text{Points of the best competitor}}$$

The normalised points shall be recorded to the first decimal number.

- c) In order to decide the winner when there is a tie, the best discarded flight shall be taken into account.

5.5.4.4 Launching

- a) Before launching, the competitor has to show to his timekeeper how he controls his motor(s) on his transmitter (on, off, reversing);
- b) The launch will occur behind the safety line within 10 m from Base A.
- c) The model aircraft is released into flight directly from the hands of the competitor or his helper, without assistance. The model aircraft shall not be launched from a height greater than the flier's normal reach above the ground.
- d) After the aircraft is hand-launched and the timing device is started, no further launching is allowed. The flight is considered official, whether the model aircraft is airborne or not.

5.5.4.5 Distance Task

- a) This task begins when the model aircraft is hand-launched and ends after 200 seconds. Time of release is to be taken by one timekeeper.

This task must be carried out with at least two climbs with motor running however no more than ten climbs with the motor running are allowed. No points will be awarded for the legs completed after an eleventh or more climb with motor running.

The competitor has to decide how much time he will use for each climb (motor run) and how much for gliding.

- b) When after stopping the motor the model aircraft first crosses the Base A in the direction of Base B, counting of the legs begins. The model aircraft must complete as many legs as possible from the starting point Base A to the Base B and return;
- c) Restarting the motor stops counting the legs, as does the expiration of the 200 seconds.
- d) A timekeeper or electronic device (if approved by EDIC) announces to the competitor when his model aircraft crosses the Base A and Base B. The absence of a signal will indicate that the model aircraft has failed to correctly cross the base. The instruments used to check the crossing of the vertical plane must assure the parallelism of such planes.

During the scoring in this task, flying with any part of the model aircraft on the forbidden side of the safety plane will give ZERO points for the whole flight, distance and duration.

Circumstances beyond the control of the pilot (malfunction of the scoring equipment, interruptions etc) do not permit crossing of the safety plane. A reflight is not permitted if the safety plane is crossed without the permission of the contest director.

- e) The competitor, his helper(s) and the team manager must remain at Base A until the distance part of the flight is completed. Nobody, other than the Base B signal operator, may stay in the B line and give signals.
- f) Every completed leg will be awarded 10 points. When the model aircraft fails to complete at least one leg after either of the first two climbs, 30 points will be deducted from the score of this task; after 200 seconds of this task, which will be indicated by an audio signal, the duration task begins immediately.
- g) Flying out of the distance course at Base A the signal only needs to be given when the model aircraft is coming directly from Base B.

5.5.4.6 Duration and Landing Task

- a) This task must be completed within 600 seconds from the moment the audio signal is given.
- b) The competitor has to decide how much and how often he will switch on the motor.
- c) The duration task score-keeping device keeps track of the motor run time as well as the glide time. Duration task scoring ends when the model aircraft comes to rest after landing.
- d) Duration time is cumulative and one point will be awarded for each full second the model aircraft is flying. 3 points will be deducted for each 1 second of motor running time.

- e) One point will be deducted for each full second flown in excess of 600 seconds.
- f) Additional points will be awarded for landing; when the model aircraft comes to rest in the 30 m circle, 10 points will be given while coming to rest in the 20 m circle gives 20 points, and when coming to rest in the 10 m circle 30 points will be given. The distances are measured from the centre of the circle to the nose of the model aircraft.
- g) No additional points will be awarded if the landing occurs more than 630 seconds after beginning of this task (as per 5.5.4.6.a)).
- h) Flying through or close to the distance course in a manner that interferes with another competitor's distance task flight will result in a penalty of 100 points deducted from the offending competitor's score of this round. This penalty can be applied by the contest director or a designated official.

5.5.4.7 Site

The competition must be held at a site having reasonable level terrain with a reasonable low probability of slope or wave soaring.

5.5.7 F5E – RC SOLAR POWERED MOTOR GLIDERS (PROVISIONAL)

5.5.7.1 Definition

- a) This is a closed-course energy accumulation, total distance, and landing event for radio-controlled electric-powered model aircraft using a combination of silicon solar cells and batteries. The flight shall begin and conclude with a measured state of battery energy. A penalty shall be applied for finishing with less than the starting battery energy. In this manner, the battery shall serve primarily as a buffer for solar energy.

- b) Model Aircraft Specifications

General Specifications: See paragraph 5.5.1.3.

Solar Array: The solar array must be composed solely of silicon solar cells on the top surface of the model having area between 21 dm² and 43 dm².

Propulsion/Receiver Power Source: See paragraph 5.5.1.3 a) Maximum 42 volts.

The model's RC control system will use the same power source as is used for propulsion. No separate battery is allowed for the radio control system.

Either the battery's balance port or an extension of the battery's balance port must be accessible to a 2.54 mm spaced male header connector with model inverted. Alternatively an approved telemetry based system maybe used to determine the battery voltage.

- c) Model Aircraft Telemetry and Electronics

Model aircraft must be equipped with either GPS telemetry to demonstrate the model's position relative to Base A and Base B planes to contest officials, or contest organizers may provide Base judges to document bases made, communicating this to the contestant's helper via flags or "walkie-talkie" radios or other suitable signaling devices.

All other forms of telemetry are specifically allowed.

5.5.7.2 Course Layout and Organisation

- a) The course shall be (2) parallel planes 150 meters apart per 5.5.4.2 except that there is no Safety Plane and contestants may fly on one or both sides of the sighting devices if the field boundaries permit it. Contestants shall be spaced 3 or more meters apart having the sun azimuth to their backs (if possible). At least 1 set of landing circles shall be provided at a comfortable walking distance from the distance course for each pilot.
- b) Each round will start with model aircraft in the flight group placed inverted at the launch locations. The energy state of each model will be ascertained by measuring and recording the open circuit voltage at the battery balance port. The contest director will announce launch times at 5 to 15 second intervals for each pilot in the group so as to avoid midair collisions. A timer shall be used to mark the launch time for each pilot. The helper shall upright and launch the contestant's model to begin a 400 second thermal loiter and energy accumulation task. The model may be flown anywhere within the boundaries of the field within visual line of sight of the pilot/helper. The model may not be flown beyond visual line-of-sight at any time.
- c) After the thermal loiter, a distance task is automatically started. The task starts at the Base closest to the pilot and concludes 600 seconds after launch. When the model crosses the first base after 400 seconds elapses in the direction of the other Base, counting of legs begins. The model aircraft must complete as many legs as possible from the starting Base to the other Base and return. There is no restriction on use of motor during this task.
- d) After the distance task, a 60-second precision landing task will automatically start. The objective of the task is come to rest within the 10-meter circle precisely 660 seconds after launch. Once the model comes to rest, it must be inverted by the helper within 10 seconds to end solar accumulation. The battery balance port should be measured in place or the model removed to a safe location shielding the solar array from additional energy accumulation. If the model comes to rest in a position/location such that it cannot be inverted within 10 seconds, the flight is scored 0. Alternatively an approved telemetry based system maybe used to determine the battery voltage at the end of the flight making inverting of the model unnecessary.

- e) The flying order must be arranged in rounds sub-divided into groups. The flying will be arranged in groups with up to 6 pilots in each group with the number in each group to be determined by the CD. The general direction of the launch and landing approaches may be set by the Contest Director prior to launch.

5.5.7.3 Scoring

- a) Every completed Distance leg will be awarded 10 points.
- b) Precision duration points shall be awarded at the rate of one point/second after 630 seconds. Precision duration points shall be subtracted from 30 at the rate of one point/second after 660 with no precision points awarded if the total flight time is greater than 690 seconds.
- c) An additional 30/20/10 points for landing shall be awarded if the model comes to rest in within 30-20-10 meter diameter circles as defined by a tape.
- d) Points shall be subtracted from the score if system energy at the conclusion of the flight is less than at the beginning of the flight at a rate of 1 point per net 3 watt-minutes consumed according to the formula: $(\text{net open circuit voltage loss}) \times (\text{battery pack nameplate capacity in Ah}) \times 20$.
- e) The pilot with the most points in each flight group will be awarded 1000 points. The other pilots will be awarded points according to the formula: $(\text{Individual Score} / \text{Winning Flight Group Score}) \times 1000$.

5.5.8 F5F – RC 6 CELL ELECTRIC POWERED MOTOR GLIDERS (PROVISIONAL)

Same rules as F5B except:

5.5.8.1 Model Aircraft Specifications:

Minimum weight (ready to fly)	1500g
Minimum surface area	36 dm ²
Maximum surface loading	75 g/dm ²

Type of battery Lithium Polymer

Maximum number of only serial cells 6

Cells in parallel are not permitted.

Minimum weight of battery pack: 300 g

Limitation of energy by an electronic limiter that stops the motor max 1300 watt-min.

The limiter is checked by the organiser during the contest.

If a logger is used, the data shall be retrieved during or immediately after the flight.

With the logger, 1 (one) point is deducted for every 3 (three) watt-min used over the limit.

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5.5.9 F5G – RC ELECTRIC POWERED BIG MOTOR GLIDERS (PROVISIONAL)

5.5.9.1 Definition

This contest is a duration and landing event for electric powered semi-scale gliders.

5.5.9.2 Model Aircraft Specifications:

Minimum wingspan	3.75 m
Maximum weight	7.5 kg

5.5.9.3 Duration

Same rules as F5J

5.5.9.4 Landing

Additional points will be awarded for landing; when the model aircraft first touches the ground in one of the three concentric landing circles as follows:

30 m diameter circle	10 points
20 m diameter circle	20 points
10 m diameter circle	30 points

No additional points will be awarded if the landing occurs more than 630 seconds after the beginning of this task.

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5.5.11. CLASS F5J – RC ELECTRIC POWERED THERMAL DURATION GLIDERS**THERMAL DURATION GLIDERS WITH ELECTRIC MOTOR AND ALTIMETER/MOTOR RUN TIMER (AMRT)**

Note: Refer to the Sporting Code volume EDIC – Electronic Devices in Competition, Section 1 “Technical Specifications & Guidance” for the documentation regarding specifications and guidance for the altimeter/motor run timer (AMRT).

Object: To provide a man-on-man contest for competitors flying electric powered radio-controlled thermal duration soaring gliders. Several qualifying rounds will be flown in the contest. In each qualifying round, competitors are divided into Groups. Each Group flies in a designated Working Time and competitor’s scores in each Group are normalised to produce meaningful scores irrespective of changing weather conditions during the competition. The competitors with the top aggregate scores in the qualifying rounds then fly **a minimum** of two (2) or **a maximum** of four (4) Fly-off rounds, as a single Group to determine the final placing. The exact number of Fly-off rounds will be announced by the Organiser before the start of the event.

5.5.11.1. General Rules**5.5.11.1.1. Definition of a Radio Controlled Glider with Electric Motor**

A model aircraft which is equipped with an electric motor to provide propulsion only for the purposes of launching, and in which lift is generated by aerodynamic forces acting on surfaces which remain fixed (except control surfaces). Model aircraft with variable geometry or area must comply with the specification when the surfaces are in maximum and minimum extended mode. The model aircraft must be controlled by the competitor on the ground, using radio control. Any variation of geometry or area must be actuated at distance by radio control. Any airborne device that uses airborne sensors to actuate any control surface are prohibited. Stability systems as allowed in the F5 General Rules 5.5.1.3.e are prohibited.

5.5.11.1.2. Prefabrication of the Model Aircraft

There is no requirement for the competitor to be the builder of the model. Refer C.5.1.2. in *CIAM General Rules*.

5.5.11.1.3. Characteristics of Radio Controlled Gliders with electric motor and altimeter/motor run timer (AMRT).

- a)

Maximum Surface Area	150 dm ²
Maximum Flying Mass	5 kg
Maximum wingspan	4 m
Loading	12 to 75 g/dm ²
Type of battery	Any type of rechargeable batteries
Type of motor	Any type can be used
- b) Radio equipment not using Spread Spectrum technology to International Standards must be able to operate simultaneously with other equipment at 10 KHz spacing below 50 MHz and at 20 KHz spacing above 50 MHz. When the radio does not meet this requirement, the working bandwidth (max. 50 KHz) shall be specified by the competitor.
- c) To ensure randomness of the starting order among the successive rounds, competitors not using Spread Spectrum technology equipment must enter three different transmitter frequencies with 10 KHz minimum spacing. The Organiser is entitled to use any of these three frequencies for setting the flight matrices. Once the competitor is allocated one of these three frequencies he must not change to another frequency for all flights during the whole of the preliminary rounds other than for re-flights. In case of a re-flight the competitor can be called to use any of these three frequencies for this re-flight only, as long as the call is made at least 1/2 hour prior to the beginning of the re-flight in written form to the competitor (or team manager where applicable). The content of this paragraph (c) is not applicable, if the competitor uses a Spread Spectrum technology system.
- d) Any device for the transmission of information from the model aircraft to the competitor is prohibited. A Spread Spectrum technology receiver that transmits information back to the competitor-operated transmitter, is not considered to be a “device for the transmission of information from the model aircraft to the competitor”, provided that the only information that is transmitted, is for the safe operation of the model aircraft;

i.e. signal strength and voltage of the receiver battery but not any positioning or height information.

- e) The competitor may use no more than three (3) model aircraft in the contest. The competitor may combine the parts of the model aircraft during the contest, provided the resulting model aircraft conforms to the rules and the parts have been checked before the start of the contest.
- f) All ballast must be carried internally and fastened securely within the airframe.
- g) The underside of the model aircraft must not have any protuberances or arresting devices (eg bolt, sawtooth-like protuberance, etc) that will cause the model aircraft to slow down on the ground during landing. A folding prop or the tail, including the fin, is not considered a protuberance or arresting device.
- h) Each model must be fitted with an approved AMRT in accordance with the Technical Specification published in F5J Altimeter/Motor Run Timer Technical Documentation.

The essential functions of the AMRT are:

- i) To record and display the maximum height attained (Start Height), above a ground level reference between the instant of motor start and 10 seconds after the motor is stopped and
- ii) To restrict the operation of the motor by the competitor to a single continuous run not exceeding 30 seconds.
- iii) To reset the start height displayed to “---” if the motor is restarted at any time during the flight. In this case (start height displayed to “---”, the result of the flight is 0 and the 0 result cannot be dropped from total score.

This rule can be used as a local rule at FAI World Cup and Open International events, but not at Category One events.

- i) Installation of the AMRT in a competitor’s model shall be in accordance with the requirements as detailed in the Technical Guidance Documentation.
- j) Proper operation of the AMRT including any associated display and its compatibility with other control equipment installed in the model is the responsibility of the individual competitor.
- k) To facilitate initial technical processing, all AMRTs must be easily removable for compliance checking.

The receiver command signal connection to the AMRT must be easily accessible so that at any time during the competition the Organisers have the option of installing a monitoring AMRT via a branching Y lead.

To enable the timekeeper to record data required for scoring purposes there must be easy access to the display or the connector for a plug in display. It must not be necessary to disconnect the AMRT from the receiver and/or the ESC (Electronic Speed Controller) or to remove it from the model,

The use of an additional extension cable is permitted for connecting the display. It is the responsibility of the competitor to ensure that any incorrect connection does not result in damage to the AMRT or the display.

- l) Any device other than an approved AMRT which is carried in or on the model and which enables total or partial independent control over the model’s electric drive motor operation, is prohibited. Receivers and ESCs are not affected by this rule.

5.5.11.2. Competitors and Helpers

- a) The competitor must operate his radio equipment himself.
- b) Each competitor is allowed one helper. At World and Continental Championships, when a team manager or assistant team manager are allowed, they are permitted to help the competitor.
- c) Any use of telecommunication devices (including transceivers and telephones) in the field by competitors, helpers or team managers is not allowed.

5.5.11.3. The Flying Site

- 5.5.11.3.1.**
- a) The competition must be held on a Flying Site of sufficient size to accommodate the specified layout and having reasonably level terrain, which minimises the possibility of slope and wave soaring.
 - b) There must be no significant obstructions within 100 metres of the launch/landing spots such that the launch and landing flight directions are hindered.
 - c) The flying site must include one clearly marked launch/landing spot for each competitor in a Group. –Launch/Landing spots must be arranged cross wind with a minimum distance between them of ten (10) metres.
 - d) The flying site must also include a six (6) metre wide clearly marked access corridor positioned upwind of and with its nearest edge being at least fifteen (15) metres from the launch/landing spots. (Note. If light or variable wind directions are expected, the CD may chose to place additional launch/landing spots downwind for later alternative use,) The access corridor must extend ten (10) metres beyond the first and last launch/landing spots.
 - e) The access corridor is provided to define the area of the flying site that is to be used by competitors, helpers and team managers to move to and from the launch/landing spots and to provide a defined area for the movement of other people associated with the administration of the contest. It must remain clear of unnecessary obstructions
 - f) A competitor or his helper can use 1 piece of simple tape wind indicator. The tape dimension must be max. 20mm x 2m, mounted on a rod of diameter max. 10mm and length max. 1m.
Any other indicators, testers (for temperature, pressure, wind test etc.) passive or active in the competition (starting, landing and safety corridor) area are not allowed.
Explosive indicators are not allowed.

5.5.11.4 Safety Rules

- (a) Every single infringement of the safety rules will be penalised by the deduction of points, as detailed below, from the competitor's final score. Penalties shall be listed on the score sheet of the round in which the infringement(s) occurred.
- (b) The Contest Director must define the Safety Area. This includes the access corridor and any other restricted flying areas. (ie low flying over campsites, buildings, roads etc)
- (c) Any infringement of the Safety Areas as defined by the CD - 300 points.
- (d) No part of the model aircraft must land or come to rest within the access corridor - 300 points.
- (e) The model aircraft must not contact any person within the access corridor - 1000 points.
(It is recommend that any model aircraft joining a model aircraft already established circling in lift should maintain the same direction of circling as the original model aircraft.)

5.5.11.5. Contest Flights

- 5.5.11.5.1.**
- (a) The competitor will be allowed a minimum of four (4) flights in the qualifying rounds.
 - (b) The competitor will be allowed only one attempt at each flight.
 - (c) There is an attempt when the model aircraft is released with the motor running by the competitor or his helper.
 - (d) All attempts must be timed by a timekeeper. If no time has been recorded, the competitor is entitled to a re-flight according to the priorities set out in paragraph 5.5.11.6.

5.5.11.6. Re-flights

- a) The competitor is entitled to a re-flight if:
 - i) his model in the process of being launched, collides with another model in the process of being launched;
 - ii) his model, in flight, collides with another model in flight;
 - iii) the attempt has not been judged by the timekeeper, provided that the helper or

the competitor has informed the timekeeper about the position of the model a reasonable time before landing; if this is not done, the competitor is not entitled to a re-flight if his attempt has not been judged by the timekeeper, and the result of the flight is zero;

- iv) his attempt was hindered or aborted by an unexpected event, not within his control.
- b) To claim a re-flight the competitor must ensure that the timekeeper has noted the hindering condition and must land his model as soon as possible after the event.

If the competitor continues to launch or continues to fly, after the hindering condition affected the flight, he is deemed to have waived his right to a new Working Time.

- c) A Working Time is to be granted to the competitor according to the following order of priorities:
 - i) in an incomplete Group, or in a complete Group on additional launching/landing spots; or
 - ii) in a new Group of minimum six (6) re-flyers. The new Group of re-flyers can be made up by other competitors selected by random draw. If the frequency or team membership of the drawn competitor does not fit or the competitor will not fly, the draw is repeated; or
 - iii) If this is not achievable, then with the original Group at the end of the ongoing round.
 - iv) In priority-cases ii) and iii), for the competitors allocated the re-flight, the result of the re-flight is the official score. For the other competitors, the better of their score in the ongoing round and the re-flight score will become their official score
- Any competitor of this Group who was not the competitor to whom the new attempt was allocated will not be entitled to another Working Time in case of hindering during the re-flight.

5.5.11.7. Cancellation of a flight and/or disqualification

The Flight is cancelled and recorded as a zero score if:

- a) the competitor used a model aircraft not conforming to any item of rule 5.5.11.1;
- b) the model aircraft loses any part during the launch or the flight, except when this occurs as the result of a mid-air collision with another model aircraft. Except that the loss of any part of the model aircraft during the landing (coming into contact with the ground) is not taken into account;
- c) the model aircraft is piloted by anyone other than the competitor;
- d) during landing, the nose of the model aircraft does not come to rest within 75 meters of the centre of the competitor's designated landing spot;
- e) the AMRT does not record any Start Height data.

A competitor shall be disqualified if, in the judgment of the Contest Director, there has been intentional or flagrant violation of the rules or unsafe flying.

5.5.11.8. Organisation of the Flying

5.5.11.8.1. Rounds and Groups

- a) The flying order for the initial qualifying rounds must be arranged in accordance with the transmitter frequencies in use, to permit as many simultaneous flights as possible. A minimum of six (6) competitors should be scheduled for each Group.
- b) The flying order must be scheduled in rounds sub-divided into Groups.
- c) Other than in the Fly-off, the composition of Groups should minimise the situation where any competitor flies against another many times. At a World and Continental Championship, team protection is mandatory except in Fly-offs. At Open International and World Cup events, team protection is not permitted.

For the benefit of junior pilots, the Contest Director shall grant team protection to the junior pilot and the helper he specified at the contest registration if the helper is also taking part in the contest as a pilot.

(Note In practice this will occur especially in competitions with small numbers but such occurrences should be kept to a minimum.)

- d) In order to minimise the time needed to run the contest the starting order should be arranged to get the minimum number of groups per round with the maximum possible competitors in each Group.

(Note. However, in small competitions 3 x 6 may be more practical than 2 x 9. It is recommended that groups with vacant starting positions are put at the end of each round, to keep space free for any re-flights.)

5.5.11.8.2. Flying in Groups

- a) Prior to the start of a Group's Working Time competitors are entitled to five (5) minutes preparation time during which they take position at their designated launch/landing spots and prepare their models for flight. The preparation time must not start before the end of the previous Group's Working Time.
- b) The Working Time allowed to each competitor in a Group shall be exactly ten (10) minutes duration.
- c) The Working Time for each Group must not start until the access corridor is clear of all people. Any deliberate attempt to delay the start of a Working Time by a competitor, his helper or team manager, by obstructing the access corridor will result in a zero score for that round.
- d) The Organisers must positively and unambiguously indicate the start of a Group's Working Time, by audible signal; see 5.5.11.14.1 for details.
- e) An audible signal must be given when eight (8) minutes, of the Group's Working Time has elapsed. Additionally the final ten (10) seconds must be indicated audibly by a countdown.
- f) The end of the Group's Working Time must be positively indicated by an audible signal, as for the start.

5.5.11.9. Control of Transmitters

For transmitter and frequency control see C.16.2 in CIAM General Rules.

5.5.11.10. Launching

- a) Prior to launch all AMRTs must be initialised on the designated launch/landing spots, at ground level and the initialisation observed by the Timekeeper.
- b) The general direction of the launch must be set by the Contest Director. All launches must be made in this general direction even in zero or variable light wind conditions. A penalty of 100 points will be applied for any breach of this rule.
- c) The motor must not be run before the start signal is given. A penalty of 100 points will be applied for any breach of this rule.
- d) Model must be launched inside the access corridor not more than two (2) meters from starting position mark (number) at general direction of the launch line of the access corridor. An attempt is annulled and recorded as zero, if the model aircraft is not launched within the above specified distance.
- e) The launches must be straight ahead for at least three (3) seconds, with the motor running. Any other type of launch is not allowed. A penalty of 100 points will be applied for any breach of this rule.
- f) An attempt is annulled and recorded as zero, if the model aircraft is launched before the start of a Group's Working Time.
- g) Timekeepers must be in a position behind the pilot to observe the launch but must not impede the pilot or his helper.

5.5.11.11. Flight

Throughout the whole flight, the pilot and his helper(s) must be in a 10 metre wide rectangular area from the starting line to 10 metres behind the landing point, the centre of which is formed by a straight line between starting point and landing point. A penalty of 100 points will be applied for any breach of this rule.

5.5.11.11. Landing

- a) Before the contest commences, Organisers must allocate a launch/landing spot to each competitor for each round. It is the competitor's responsibility to ensure that he always uses the correct spot for landing.
- b) The direction of the final approach to landing can be set by the Contest Director. All final approaches must be made in this direction even in zero or variable light wind conditions. A penalty of 100 points will be applied for any breach of this rule.

Taking into account the actual distance between the landing points, the distance to the safety corridor and the prevailing wind conditions, the contest director may leave the choice of the landing direction to the Pilots.

- c) Timekeepers must be in a position behind the pilot to observe the landing but must not impede the pilot or his helper.
- d) Timekeepers, helpers and competitors must not hinder other competitors or their helpers on adjacent spots.

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- e) After landing, competitors may retrieve their model aircraft before the end of their Working Time providing they do not impede other competitors or model aircraft in their Group.

5.5.11.12. Scoring

- a) The attempt must be timed from moment of release from the hand of the competitor or his helper to either:
 - i) The model aircraft first touches the ground; or
 - ii) The model aircraft first touches any object in contact with the ground; or
 - iii) Completion of the Group's Working Time.
- b) The flight time in seconds, must be truncated to the nearest second.
- c) One point will be awarded for each full second of flight within the Working Time, up to a maximum of 600 points (ie 10 minutes maximum) for the preliminary rounds or 900 points (ie 15 minutes maximum) for the Fly-off rounds.
- d) The recorded Start Height in metres shall be truncated to the nearest metre.
- e) Each metre of the recorded Start Height results in a deduction of half (0,5) a point up to 200m and three (3) points above it.
- f) Where the score is negative (below zero), a zero score will be recorded. Note that any penalty points applied in the round will remain effective. (5.5.11.4).
- g) A zero score will be recorded for overflying the end of the Group's Working Time by more than one (1) minute.
- h) A landing bonus will be awarded in accordance with distance from the launch/landing spot marked by the Organisers according to the following tabulation:

Distance (m)	Points
Up to 1	50
2	45
3	40
4	35
5	30
6	25
7	20
8	15

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9	10
10	5
over 10	0

- i) The landing bonus distance is measured from the nose of the model aircraft at rest to the centre point of the launch/landing spot allocated to the competitor. A dedicated non-elastic tape marked in bonus (landing) points is the means, by which this distance is measured.
- j) If during the landing procedure the model aircraft touches the competitor or his helper (or the team manager if present) or any deliberately placed obstruction, zero landing bonus must be allocated.

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- k) No landing bonus will be awarded if the model aircraft overflies the end of the Working Time for the Group
- l) The competitor who achieves the highest aggregate of points comprising of flight points, plus landing bonus points, less launch height deduction, will be the Group winner and will be awarded a corrected score of one thousand (1000) points for that Group.
- m) The remaining competitors in the Group will be awarded a corrected score based on their percentage of the Group winner's total score before correction (ie before being normalised for that Group) and calculated from their own total score as follows:

$$\frac{\text{Competitor's own score multiplied by 1000}}{\text{Highest points total scored in the Group before correction}}$$

- n) Penalties shall be listed on the score sheet of the round in which the infringement(s) occurred. All penalties are cumulative and will be deducted from the competitor's total score at the end of the preliminary rounds. Penalties earned in the preliminary rounds are not carried forward into the fly-off rounds. In case the total score after deduction of the penalties is negative, a zero (0) score will be recorded. The same total score will be used for individuals and team classifications.

5.5.11.13. Final Classification

- a) If four (4) or fewer qualifying rounds are flown, the aggregate score achieved by the competitor, will be the sum of his scores for all rounds flown. If more than four (4) rounds are flown, then his lowest score will be discarded before determining his aggregate score.
- b) The CD may elect not to have a fly off. This decision is announced in the invitation or before the start of the competition.
- c) At the end of the qualifying rounds 30% (rounded down) of competitors with the highest aggregate scores will be placed together in a single Group comprising a minimum of six (6) and maximum of fourteen (14) for the fly-off rounds. For operational reasons the CD may set a lower maximum
- d) A minimum of three (3) or maximum of four (4) fly-off rounds should be flown. Exceptionally the CD may reduce to two (2) in the case of bad weather or poor visibility
- e) The Working Time for the fly-off rounds will be fifteen (15) minutes duration. An audible signal must be given at the start of the Group Working Time and at exactly thirteen (13) minutes and at exactly fifteen (15) minutes. Additionally, the final ten (10) seconds must be indicated audibly by a countdown.
- f) The scoring of the fly-off rounds shall be as in section 5.5.11.12.
- g) Final placing of the competitors who qualify for the fly-off, shall be determined by their aggregate scores in the fly-off rounds; their scores in the qualifying rounds being discarded.

- h) In the event that two or more competitors have the same aggregate fly-off score, final positions of those competitors shall be determined by their respective position in the qualifying rounds; the higher positioned competitor being awarded the higher final position.
- i) The national team classification is established after the completion of the championship by adding the aggregate scores of qualifying rounds of the three members of the team together. In the case of a national team tie, the team with the lower sum of place numbers, given in order from the top, wins. If still equal, the best individual placing decides.

5.5.11.14. Advisory Information

5.5.11.14.1. Organisational Requirements

- a) The Organiser shall ensure that each competitor has no doubt about the precise second that a Group Working Time starts and finishes.
- b) Any audible signal may be by automobile horn, bell or public address system etc. It must be remembered that sound does not travel far against the wind; therefore the positioning of the audio source must be given some thought.
- c) The audible signal must be clear and unambiguous in its meaning.
- d) To be a fair contest, the minimum number of fliers in any one Group is six (6). As the contest proceeds, some competitors may be obliged to drop out for various reasons. When a Group occurs with five (5) or fewer competitors in it, the Organiser should move a competitor up from a later Group, ensuring if possible, that he has not flown against any of the others in previous rounds and that his frequency is compatible.
- e) For contests with 30 pilots or less at the beginning of the contest the organiser should move up a competitor from a later group when a group occurs with four (4) or fewer competitors instead of minimum six (6) at the beginning of the contest or cancel the group and fill up the other groups accordingly.

5.5.11.14.2. Timekeeper Responsibilities

The Organiser must ensure that all timekeepers are fully aware of just how important their duties are, their responsibilities and the requirements for safety on the Flying Site. The Organiser must make certain that Timekeepers are fully conversant with the rules particularly those that in certain cases require quick positive action to ensure that any competitors chances in the competition are not jeopardised.

Timekeepers must:

- i) observe the initialisation of the AMRT;
- ii) observe the launch, flight and landing, and record any breaches of the rules;
- iii) time and record the flight time;
- iv) measure and record the landing bonus distance;
- v) observe and record the Start Height from the AMRT;
- vi) not impede the pilot or his helpers nor hinder those on the adjacent spots.

5.5.10 F5K – RC THERMAL DURATION GLIDERS FOR MULTIPLE TASK COMPETITION WITH ELECTRIC MOTOR AND ALTIMETER/MOTOR RUN TIMER (AMRT) – (PROVISIONAL)

5.5.10.1 F5K Introduction

The F5K event is a multi-task contest where the RC gliders must start and land in a specific “Pilot Area” and perform specific tasks.

Each launch is scored with points made up of:

- flight time in seconds (may be zero)
- altitude bonus or penalty points
- penalties (if applicable)

If the total of all points is negative, the score is zero (0). The score is the accumulation of the flight times, adjusted for penalties and bonuses for launch altitude and any other penalties (if applicable).

5.5.10.2 Task Overview:

Task A: 1, 2, 3, 4 minute flights in any order

- Four launches maximum within a 10 minute window
- 1, 2, 3 and 4 minutes target times, flown in any order within a 10 minute window
- Each flight counts even if the target time is not achieved
- Maximum total flight time used for scoring: 9.59 min.
- After 10 minutes the competitor will have 15 seconds to land. If he lands after these 15 seconds, the flight penalty is 100 points

Task B: Last flight, 5 out of 7 minutes

- Three launches maximum within a 7 minute window
 - All competitors of a group must launch their model gliders simultaneously
 - Only the last flight counts
 - Maximum measured flight time is 5 minutes. It is allowed to overfly the 5 minutes target time
 - There will be a launch penalty in case a competitor uses more than 1 launch
 - First launch : no launch penalty – zero penalty points
 - Second launch : launch penalty is 10 points
 - Third launch : additional launch penalty of 10 points (20 points total penalty)
- The number of flights is registered on the scorecard
- After 7 minutes the competitor will have 15 seconds to land. If he lands after these 15 seconds, the flight penalty is 100 points

Task C: All up, 4 minutes maximum (3x)

- Three (3) flights of 4 minutes maximum
- The maximum measured flight time is 4 minutes during each all up task
- After 4 minutes the competitor will have 15 seconds to land. If he lands after these 15 seconds, the flight penalty is 100 points
- After the 15 second landing window, the preparation time for the next All-up flight is 15 seconds

Task D: 3, 3, 4 minute flights in any order

- Three launches maximum within a 10 minute window
- 3, 3 and 4 minutes target times, flown in any order within a 10 minute window
- Each flight counts even if the target time is not achieved
- Maximum total flight time used for scoring: 9.59 min.

- After 10 minutes the competitor will have 15 seconds to land. If he lands after these 15 seconds, the flight penalty is 100 points

Task E: Poker

- Working time is 10 minutes
- Each competitor has a maximum of three launches to achieve up to three self-nominated target times within the working time
- The target and maximum allowable flight time is 9 minutes and 59 seconds
- The pilot can announce “**all in**” for his first launch. Only *one launch* is then allowed.
- **Before the first launch of any new target, each competitor announces a target time to the timekeeper.** The timekeeper records the nominated target time on the score card
- The pilot can any use remaining launches to try to reach his target time up until the end of working time
- If the target is reached (or exceeded) the timekeeper will mark the flight with “Y” (time achieved). The pilot is credited with the target time. **Any time over the target time is not counted**
- The launch bonus or penalty applies where the target time is achieved. If the pilot has unused launches, before launch he must announce the next target time (less, more or “end of working time”) to the timekeeper
- The timekeeper writes this against the next flight number on the scorecard and the pilot takes his new launch
- Only one attempt is allowed if the pilot announces “*end of working time*”
- **If the target time is not reached**, the timekeeper will mark the flight with “N” (not achieved). The launch bonus or penalty does not apply where the target time is not achieved. While the pilot has unused launches, the target time remains the same for the next launch. The timekeeper writes this target time against the next flight number and the pilot takes his new launch
- Flights with achieved target times are scored, adjusted for height, bonus or penalty, landing out of the pilot area and any flight penalties
- Launch penalty applies whenever a launch is made. **The penalty applies even if the flight fails to achieve the target time**
 - First launch : no launch penalty – zero penalty points
 - Second launch : launch penalty is 10 points
 - Third launch : additional launch penalty of 20 points (30 points total penalty)
- The number of flights is registered on the scorecard
- After 10 minutes the competitor will have 15 seconds to land. If he lands after these 15 seconds, the flight penalty is 100 points

5.5.10.3 Nominal Launch Height (NLH)

One (1) day before the start of the competition, the Contest Director will announce the nominal launch height for the competition day. For this he will take the average windspeed between 11h and 17h.

Wind Forecast	Between [m/s]		Nominal Launch Height (NLH)	Motor time [sec] in AMRT
Light breeze	0	3	60	7 sec
Moderate wind	4	6	70	
Strong wind	over 6 m/s		80	

* The maximum wind speed for F5K contests is eight (8) m/sec

The motor stop is controlled by two parameters: the "Nominal launch height" or the "Motor time". Both parameters are set in an altitude device (AMRT, for example an Altis Nano from Aerobtec).

However, the pilot can stop the engine earlier or at a lower altitude to gain additional launch bonus points.

5.5.10.4 Penalty and Bonus Rules During Launch:

Penalty or bonus points apply to launches that are over or under the NLH. The launch height is the highest altitude reached from launch until 10 seconds after the motor is stopped.

- For each metre under the NLH, 0.5 points per metre bonus applies.
- For each metre from 1 to 10 metre over the NLH, 1.0 points per metre penalty applies.
- For each metre from 11 metre over the NLH, 3.0 points per metre applies.

The bonus or penalty is always calculated with reference to the announced NLH.

5.5.10.5 Launch and Start Flight Time:

- a) The Contest Director will announce the direction of launch. All competitors must launch and land in that direction.
- b) The AMRT is activated before the start of the working time with the model glider still on the ground to set the zero meter offset correct.
- c) The flight time starts at launch, meaning the moment the model glider is released from the helper's or competitor's hands, not at the start of the acoustic signal. Starting the motor without launching the plane does not count as start flight time.
- d) A helper may launch the model glider for the competitor.

5.5.10.6 Land and End Flight Time:

- a) The flight timing ends when the model comes to rest on the ground or at the acoustic signal, even if the competitor is still flying.
- b) It is not permitted to catch a model glider for a landing, all flights must conclude with a ground landing. This includes the landings between flights as well as the final landing of the last flight of the task.
- c) At the end of each task the model glider must land within the Pilot Area boundary.
- d) Landing outside the Pilot Area but within the flying field results in a 10 points penalty per landing.
- e) Landing outside the flying field will result in a zero score for the round.
- f) If any part of the model glider is inside a boundary, it is considered to have landed inside the boundary.
- g) No points are deducted for flying over the maximum flight time or past the end of the working time.
- h) For all Tasks a 15 seconds landing window will begin at the end of the working time.

5.5.10.7 Launch Altitude – Altimeter / Motor Run Timer (AMRT):

- a) Each model must be fitted with an approved AMRT in accordance with the Technical Specification published in F5K Altimeter/Motor Run Timer Technical Documentation.
- b) The launch altitude is recorded in the AMRT. After the task, the launch altitudes for each flight are shown on the display. The pilot only has to record his launch altitude on the scorecard. The competition software converts the launch altitude into any bonuses or penalties.

Note: Refer to the Sporting Code volume EDIC – Electronic Devices in Competition, Section 1 "Technical Specifications & Guidance" for the documentation regarding specifications and guidance for the altimeter/motor run timer (AMRT).

5.5.10.8 Helper / Timekeepers:

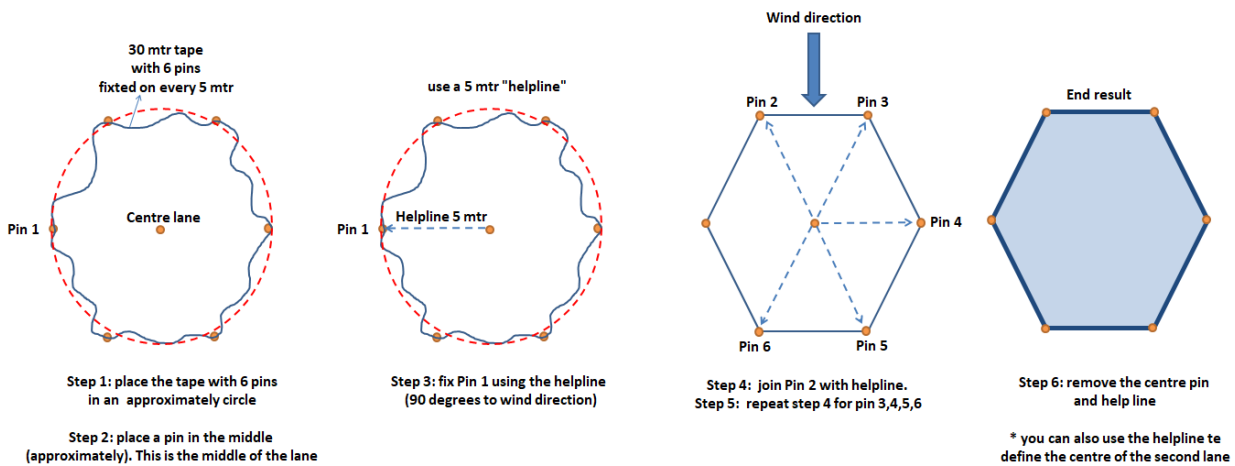
- a) The helper / timekeeper may coach the pilot during flight.
- b) The helper / timekeeper may help to retrieve the model glider, if it has landed outside the flying field or Pilot Area.

5.5.10.9 Definition of the Model Glider

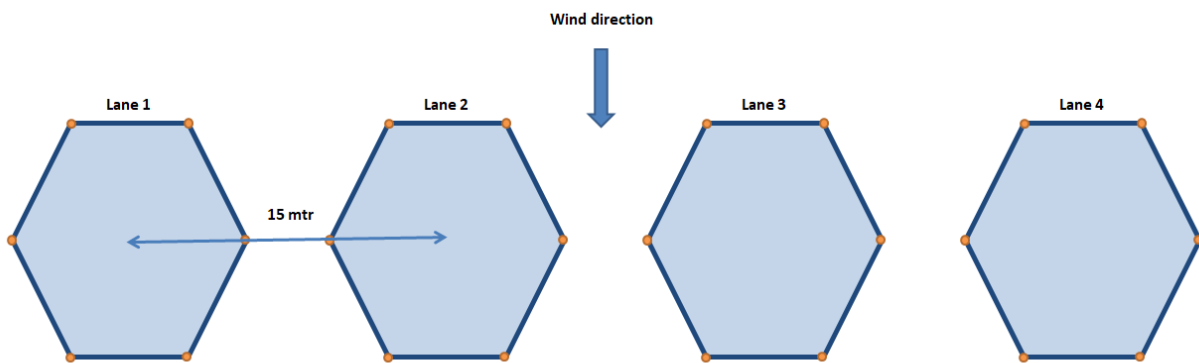
- a) Maximum wingspan - 1500 mm
- b) Minimum loading - 12 g/dm²
- c) Maximum flying weight - 600 gram
- d) Maximum 3 cell (3S) batteries are allowed
- e) The use of any automatic flight control or stabilization is not allowed

f) Any construction materials are permitted

5.5.10.10 Launch and Landing area (Pilots Area):



a) The Launch and Landing area is defined using a 30 metre tape pinned around the centre making a hexagon with an outer enclosing circle with a diameter of 10 metres, called the individual "Pilot Area".



b) The distance between two Pilot Areas is 15 metres from centre to centre, perpendicular to the wind direction.

c) The boundary of the rectangular flying field will nowhere be closer than 15 meters from the centre of any Pilot Area.

5.5.10.11 Flight and Round Penalties:

5.5.10.11.1 Flight Penalty:

- Flying in a no fly zone will result in a 300 point penalty for the flight score.
- Overfly landing window will result in a 100 point penalty for the flight score.

5.5.10.11.2 Round Penalty:

- Hitting some else in another Pilot area will result is a zero (0) for the round.
- Motor restart during flight will result in a zero (0) for the round.
- Landing outside the flying field (as defined by the CD) will result in a zero (0) for the round.

In case of a mid-air collisions of two or more model gliders the competitors will not be granted reflights nor will penalties be applied.

5.5.10.12 Preparation time

For each round, the competitors receive at least 5 minutes of preparation time.

5.5.10.13 Scoring

- a) The scores are normalized within each group, 1000 points being the basis for the best score of the winner of the group. The result of a task is measured in points and truncated down to the whole points.
- b) The normalized scores within a group are calculated by using the following formula:
normalized score (points) = competitor's result (points) / best competitor's result (points) x 1000.
- c) The normalized scores are rounded to whole numbers (points).

5.5.10.14 Final Score

The final score is the sum of the normalized scores of all rounds. If eight (8) or more rounds are flown then the lowest score is dropped.

5.5.10.15 Resolution of a Tie

In the case of a tie, the best dropped score defines the ranking. If the tie still exists, a separate fly-off for the relevant competitors will be flown to achieve a ranking. In this case the contest director will define one task that will be flown for the tie-break fly-off.

5.5.10.16 Fly-off

The organiser may announce a fly-off prior to the beginning of the event. For World and Continental Championships, the fly-off is mandatory for seniors. The fly-off should consist of at least three (3) rounds with a maximum of six (6) rounds. If less than three (3) fly-off rounds can be completed, the result of the preliminary rounds determine the final ranking. A junior fly-off may be held with the maximum number of competitors being 2/3 of the seniors fly-off. A separate junior fly-off is not mandatory. If a fly-off is flown, the points of the previous rounds are not considered for the final score.

5.5.10.17 Team Classification

To establish the ranking for international team classification, the final individual scores of the three best members of the team are added together. Teams are ranked according to the highest numerical score to lowest. In the case of a national team tie, the team with the lower sum of the place numbers, given in order from the top, wins. If still equal, the best individual placing decides.

5.5.10.18 Contest Director and Jury:

The above rules are taken as a starting point. The CD makes the best decision to the best of his knowledge. The CD can install a jury. The total of the CD and the jury must be an unequal number. If an incident occurs, the CD and the jury can force a decision by voting.

ANNEX of F5K Thermal Duration Gliders for Multiple Task Competition Rule

Local rules, The Netherlands 2021:

FAI rule	Local rule	Explanation
Minimum loading 12 g/dm ²	<12 g/dm ²	Planes with lower loading are also allowed (e-dlg planes)
Motor restart	100 point penalty	Only if the motor accidentally restarts during landing. The penalty applies to the flight.

CLASS F5L – RADIO CONTROLLED THERMAL GLIDERS RES WITH ELECTRIC MOTOR AND AMRT

5.5.12.1 General Rules

F5L is a class for radio-controlled 2-axis gliders with an electric motor and a logger.

F5L class is similar to F3L one and differs only by the starting procedure with an electric motor instead of a bungee.

The models feature a maximum two (2) meter span, are primarily of wooden construction and are controlled by rudder, elevator and spoiler(s). For launching, the electric motor may run 30 sec. Due to the restrictions on construction and equipment, it will be possible to participate in competitions at low costs and with average skills. One key aspect of this class is to inspire young modellers and integrate them into the sport. The rules that follow shall be understood and interpreted with this in mind.

5.5.12.2 Definition of a Radio-Controlled Glider

A model aircraft whose lift is generated by aerodynamic forces acting on surfaces remaining fixed. In F5L class, the electric motor serves only for the launch.

The competitor must control the model from the ground using radio control.

5.5.12.3 Model Specifications for Radio Controlled Thermal Gliders F5L

A model typically consists of wings, fuselage and tail. Flying wing models that do not have a fuselage and rudder or vertical stabilizer or none of these components are also allowed if they have only two (2) control surfaces. Each of these surfaces has to be actuated by only one servo. Otherwise, the construction rules for conventional models described herein are applicable.

5.5.12.3.1 The model is build-on mainly with wooden parts. The following methods are permitted:

- a) Wings built with ribs, open or covered by wood, „D-box“, solid wood wings or a combination of solid wood and ribs.
- b) All parts must be made from wood except for the leading edge, spar(s) and connecting parts of the wing panels and the motor mount frame.
- c) The surface of the wings may be covered by film, silk, paper or polyester fabric.
Specifications a) to c) are applicable for the tail planes too.
- d) The space between the rear edge of the spoilers and the trailing edge must be at least 5 cm. One or two servos may activate the spoilers.
- e) The fuselage must be made entirely from wood or with a tail boom made from fibreglass/carbon (GRP/CFRP), Kevlar tube, or profile. The tube/profile must not extend the front half of the wing area.
- f) The wooden surface of the fuselage may be covered with fibreglass/carbon (GRP/CFRP) or Kevlar, but not more than a maximum of 1/3rd of the total area. The surface may be protected with varnish or like described in c).
- g) Hinges and control rods are exempted from the GRP/CFRP constraint.
- h) The selection of the electric motor is free.
- g) The selection of battery is free

5.5.12.3.2 Not allowed is the use of

- a) positive or negative moulds for construction of the fuselage or wings or the surface treatment.
- b) a fixed or retractable arresting device (i.e. bolt, sawtooth-like protuberance, etc.) to slow down the model on the ground during landing. The underside of the model must not have any protuberances.

- c) a fuselage nose with a radius less than 5 mm.
- d) ballast not carried internally and fastened securely within the airframe.
- e) any telemetry except for radio signal strength, receiver temperature and battery voltage. No variometer is permitted.
- f) any telecommunication between competitor and helpers, including mobile phones or walkie-talkies.

5.5.12.4 Description of the Competition

- a) In competition, at least four (4) qualifying rounds shall be flown. For each qualifying round, participants shall be divided into flight groups. The results of each flight group shall be normalized to arrive at comparable scores between the flight groups. The highest score within each flight group will be assigned 1000 points, and the remaining scores within that group shall be proportional to each participant's raw flight score relative to the best raw flight score within that group. The group size in the "Fly-Off" shall be the same as in the preliminary rounds. Participants flying with the highest total normalized scores from the preliminary round will compete in a "fly-off" (minimum 2 rounds) to determine the final classification.
- b) The competitor may use three (3) models in the contest. The competitor may change models at any time, but within a round only if the model used first is placed within a radius of 15 meters of the assigned landing spot.
- c) The competitor may use up to two (2) helpers. These assist him in launching and retrieving the model, informing him of weather conditions and flight time and managing the start.
- d) The organizer should have official scorekeepers/timekeepers available. If this is not the case, the pilot's helper will keep time, and the organizer will regularly sample the flight times. Deviations of more than three (3) Seconds in favour of the participant shall lead to a zero-score flight.

5.5.12.5 The flying Site

- a) The competition must be held on a site having reasonably level terrain, which will minimise the possibility of slope and wave soaring.
- b) There must be marked start/landing spots for each competitor at least eight (8) meters apart. Take-off should happen within two (2) meters of the assigned start/landing point. This rule also applies when starting again.
- c) The distance between the fuselage nose and the landing point will be measured by a tape or string, which may be fixed at the landing point.
- d) The Contest Director shall determine the landing boundaries. Landing outside the boundary shall result in a zero score for that flight. (see also 8.2).

5.5.12.6 Interruptions

- a) The contest director can interrupt the competition and reset the start/landing points.
- b) The contest shall be interrupted by the contest director if the weather conditions for the models are no longer reasonable.

5.5.12.7 Launching

Starting is after the beginning of the frame time with the electric motor running.

For designs that do not permit a safe start with the motor running (e.g., wing-mounted aircraft with rear-mounted motor), the motor is switched on as soon as possible after the launch, and the time begins when the motor is switched on.

The motor runtime (30 sec) and the starting height (90m) are limited by an EDIC-approved e-logger (e.g., Altis V4, Altis V4+, Altis Micro, Altis Nano etc). The organizer should check the settings of the AMRT before the competition. The organizer can check the AMRT at any time after a flight. The flight is recorded as a zero score if the settings differ from the pre-sets.

Requirements for the AMRT:

- a) Time and altitude shutdown.
- b) No telemetry during competitive flight.
- c) No change in the setting values via the transmitter.
- d) Storage of the (last) flight with switch-on and switch-off point (altitude and time) of the electric motor.
- e) it shall be possible to check after a flight;

5.5.12.8 Contest Flights

- a) The competitor is entitled to at least four (4) official flights.
- b) The competitor is entitled to unlimited attempts during the working time.
Before restarting, the flight battery must be briefly disconnected from the controller to reset the AMRT.
- c) An official attempt begins when the model leaves the hand of the competitor or his helper with the electric motor running.
- d) In case of multiple attempts, the result of the last flight will be the official score.

5.5.12.9 Re-flights

The competitor is entitled to a new working time if:

- a) his model in flight or in the process of being launched collides with another model flying or being launched.
- b) When his flight is hindered or aborted by an event beyond his control.

To claim a re-flight considering the conditions mentioned above, the competitor has to make sure that the official timekeepers have noticed the hindering conditions and land his model as soon as possible after this event.

Note that if the competitor continues to launch or fly after hindering conditions affecting his flight or does a re-launch after clearing the hindering condition(s), he is deemed to have waived his right to a new working time.

5.5.12.10 Landing

- a) Each competitor will be assigned a start/landing spot before each flight. The competitor shall be responsible for using the correct assigned landing spot.
- b) During the landing process, only the pilot and his assistant are allowed within 10 meters of the landing spot. Any other helpers and timekeepers shall stay at a distance.
- c) After landing, competitors may retrieve their model aircraft before the end of their working time, providing they do not impede other competitors or model aircraft in their group. A model thus retrieved may be relaunched during the working time. No landing score may be recorded for a model touched before scoring the landing.

5.5.12.11 Scoring

The raw flight score for each round consists of the flight time score and landing bonus points.

5.5.12.11.1 Scoring of the Flight Time

The attempt will be timed from the moment of release from the hand of the starter device to either:

- a) the model aircraft first touches the ground; or
- b) completion of the group's working time.

The maximum flight time is 6 minutes and 30 seconds (390s) within nine (9) minutes (540s) working time. The flight time will be recorded in full seconds. If the flight is longer than (6:30) minutes (390s), the overflying time will be deducted from (6:30) minutes (390s). Each second of flight time will be scored two (2) points. The highest score within each flight group will be

assigned 1000 points, and the remaining scores within that group shall be proportional to each participant's raw flight score relative to the best raw flight score within that group.

5.5.12.11.2 Scoring of the Landing

A landing bonus will be awarded in accordance with distance from the landing spot marked by the organisers according to the following tabulation:

Distance from spot	points	Distance from spot	points
up to m(meters)		up to m(meters)	
0.2	100	5	80
0.4	99	6	75
0.6	98	7	70
0.8	97	8	65
1.0	96	9	60
1.2	95	10	55
1.4	94	11	50
1.6	93	12	45
1.8	92	13	40
2.0	91	14	35
3.0	90	15	30
4.0	85	over 15	0

Zero points for landing will be recorded for the competitor, if:

- the model loses any part.
- the model is not airworthy after landing. If there is any doubt about this, the airworthiness must be demonstrated.
- the model is overflying the group's working time.
- the model touched the competitor or helper during the landing.
- the competitor or helper touched the model before the official scorekeeper made the distance measuring.

Zero points for the entire task (flight and landing) are awarded if:

- The model rests outside a landing area as defined by the organizer. Within the working time, the competitor may launch for another attempt.
- the model is overflying the working time for more than 30 seconds.

5.5.12.12 Final Classification

If five (5) or fewer qualifying rounds are flown, the aggregate score achieved by the competitor will be the sum of his scores for all rounds flown. If more than five (5) rounds are flown, his lowest score will be discarded before determining his aggregate score.

For competitors who qualified for the fly-off, the final ranking is determined by the ranking at the fly-off; for other competitors, the ranking is done by the ranking at the qualifying rounds.

5.5.12.13 Additional Information

The Information Bulletin will state any expected modifications of air space limitations.

ANNEX 5E

RULES FOR ELECTRIC FLIGHT (F5B, F5J) WORLD CUP EVENTS

5E.1. General Rules

- 5E.1.1. The General Rules for FAI World Cup with all the principle points concerning the responsibility and the organisation of World Cup are written in the FAI Sporting Code, Volume *CIAM General Rules C.2*.
- 5E.1.2. The Open International Contests that could be nominated by the F5 Subcommittee as a World Cup contest are described in the FAI Sporting Code, Volume *CIAM General Rules Section C.2.2*.

5E. 2. Procedure for Nomination of World Cup Contests

- 5E. 2.1 The Electric Flight World Cup will be organised in classes F5B (Multi-Task Gliders) and F5J (Thermal Duration Gliders) every year.
- 5E. 2.2. Requests for open international contests that are planned as World Cup contests must be checked by the Subcommittee Chairman before they will be published in the FAI International Sporting Calendar.
- 5E. 2.3. Contests that are not published in the Sporting Calendar could not be World Cup contests.
- 5E. 2.4. The World Cup Coordinator collects results of each competition, produces and distributes the World Cup positions.
- 5E. 2.5. World Cups will be awarded at the CIAM Plenary meeting to winners or delegates of their NACs.

5E. 3. Classification

- 5E. 3.1. In the case of twenty (20) or fewer World Cup contests during a year, a maximum of three (3) contests will be counted. In the case of more than twenty (20) World Cup contests during a year, a maximum of four (4) contests will be counted. If a competitor flies in more than three (or four contests), his best three (or four results) will be allocated.
- 5E. 3.2. Not more than one (1) contest could be counted in the same country. In case of counties with more than 2 time zones, two (2) contests could be counted.
- 5E. 3.3. Points awarded at a World Cup Contest
- NOTE: See the table on the following page.**
- 5E.3.4. Juniors and Women
- There will be a separate classification for juniors and women, provided that more than 10 such competitors are listed in the World Cup ranking. Medals and diplomas shall be awarded in accordance with CGR C.2.2.3.

Points awarded at a World Cup Contest:

	Number of competitors (with valid results)				Number of competitors (with valid results)				Number of competitors (with valid results)			
Position	70 and more	40 - 69	39 and less		Position	70 and more	40 - 69	39 and less	Position	70 and more	40 - 69	39 and less
1.	100	90	80		31.	50	39	9	61.	20	9	
2.	90	80	70		32.	49	38	8	62.	19	8	
3.	85	75	65		33.	48	37	7	63.	18	7	
4.	80	70	60		34.	47	36	6	64.	17	6	
5.	77	67	55		35.	46	35	5	65.	16	5	
6.	75	65	50		36.	45	34	4	66.	15	4	
7.	74	63	45		37.	44	33	3	67.	14	3	
8.	73	62	42		38.	43	32	2	68.	13	2	
9.	72	61	39		39.	42	31	1	69.	12	1	
10.	71	60	36		40.	41	30		70.	11		
11.	70	59	34		41.	40	29		71.	10		
12.	69	58	32		42.	39	28		72.	9		
13.	68	57	30		43.	38	27		73.	8		
14.	67	56	28		44.	37	26		74.	7		
15.	66	55	26		45.	36	25		75.	6		
16.	65	54	24		46.	35	24		76.	5		
17.	64	53	23		47.	34	23		77.	4		
18.	63	52	22		48.	33	22		78.	3		
19.	62	51	21		49.	32	21		79.	2		
20.	61	50	20		50.	31	20		80.	1		
21.	60	49	19		51.	30	19		81 - last	1		
22.	59	48	18		52.	29	18					
23.	58	47	17		53.	28	17					
24.	57	46	16		54.	27	16					
25.	56	45	15		55.	26	15					
26.	55	44	14		56.	25	14					
27.	54	43	13		57.	24	13					
28.	53	42	12		58.	23	12					
29.	52	41	11		59.	22	11					
30.	51	40	10		60.	21	10					