



BRITISH MODEL FLYING ASSOCIATION

CONTEST RULES

SECTION 8

SPACE MODELS

To be read in conjunction with the General Rules, Sections 1 and 2,
which are available free of charge from the BMFA

Effective January 2011

Supersedes January 2010 Issue

Price £3.00

CONTEST RULES - SECTION 8

SPACE MODELS - 2011

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NOTES

New Rules

For ease of reference, new rules and rule changes are denoted by a side bar, thus.

Changes

There are minor changes to the General, Engine Standards, Launching at International Contests and Class S7 (Scale) Rules.

There are changes to the judging criteria for R/C flight characteristics.

There are significant changes to the Judges guide, especially concerning clusters and the use of electronic altimeters.

Gender

Throughout this rule book the pronoun 'he' is used for conciseness. 'She' should be substituted when appropriate.

FAI Classes - Numbering System

As noted in the index on page 1, BMFA class numbers have been allocated to the FAI Space Modelling classes. As a prefix in these class numbers, the BMFA rules section number 8 is shown.

The BMFA class numbers reflect the relevant section of the FAI Sporting Code. For instance, 8.5, Altitude Competition (Class S-1), is section 8 of the BMFA Rule Books, then section 5 of the Sporting Code.

FAI Classes Copyright

Copyright of the specific FAI rules in this document is owned by the Fédération Aéronautique Internationale (FAI).

8.0 BMFA GENERAL RULES

8.0.1 UK Motor requirements

Competition motors for all events are available from FAIR. Contact is via the BMFA office.

8.0.2 Records

BMFA registered UK records are available for all FAI and BMFA classes.

Note that UK records may be claimed for flights made abroad by UK citizens.

8.0.3 Jettisoning of Parts

A flight will be disqualified if any part of the model, as launched, becomes detached. The exceptions to this rule are for S4 (boost glider) where the engine(s) shall be ejected in accordance with 8.2.4.1 and 8.2.4.2, S7 (scale) and any models that are staged. **In all cases, the in-flight discarding of ejection pistons and/or wadding will result in the flight being disqualified.**

8.1 GENERAL DEFINITIONS

8.1.1 Space Model

“Space Model” means an aeromodel that ascends into the air without the use of aerodynamic lifting forces against gravity; that is propelled by means of a space model engine; that includes a device for returning it safely to the ground in a condition to fly again; and that is made of substantially non-metallic parts.

8.1.2 SPACE MODEL ENGINE

“Space model engine” means a solid propellant rocket reaction engine in which all chemical ingredients of a combustible nature are pre-mixed and ready for use.

8.1.3 CLASSIFICATION OF SPACE MODELS

- S1 Altitude Models
- S2 Payload Models
- S3 Parachute duration models
- S4 Boost-glider duration models
- S5 Scale-altitude models
- S6 Streamer duration models
- S7 Scale models
- S8 Rocket glider duration models
- S9 Gyrocopter duration models
- S10 Flex-wing duration models

Each class, except class S7 has been subdivided related to engine size. Refer to the rules applicable to each particular class.

8.2 SPACE MODEL SPECIFICATIONS

A space model must comply with the following requirements prior to launch, operation and flight.

8.2.1 WEIGHT

Gross or maximum weight, including space model engine or engines shall in no event exceed 1500 grams. It will be specified separately for each class in these rules.

8.2.2 PROPELLANT

No more than 200 g of propellant materials shall be contained in its space model engines nor shall their total impulse exceed 160 Newton-seconds (Ns).

8.2.3 STAGES OF OPERATION

8.2.3.1 There shall be no more than three (3) operable stages. A stage is defined as a portion of the model airframe containing one or more space model engines that is designed to separate or which actually separates from the model while in flight. An un-powered part of the model is not considered to be a stage. The configuration of a model is considered to be that of the model at the instant of first motion on the launcher. Engines ignited simultaneously are considered one stage regardless of the number of separated parts; for example Soyuz.

8.2.3.2 Total impulse of engine(s) in a lower (booster) stage must, for safety reasons, be equal or greater than total impulse of engine(s) in (any) of upper stage(s). The thrust of the booster stage also must be equal or greater than the thrust of each of the upper stages. This does not relate the strapped-on boosters which are ignited simultaneously with the booster stage.

8.2.4 CONSTRUCTION REQUIREMENTS

8.2.4.1 A space model shall be so constructed to be capable of more than a single flight and shall contain a means for retarding its descent to the ground so that its structure may not be substantially damaged and so that no hazard is created to persons and property on the ground.

8.2.4.2 A space model must not eject its engine(s) in flight unless it/they is/are enclosed in an airframe that will descend in accordance with the provisions of paragraph 2.4.1. The engine(s) of the models cannot be fastened by glue and cannot be an integral part of model's construction.

8.2.4.3 Construction shall be of wood, paper, rubber, breakable plastic or similar materials without substantial metal parts. Models of Classes S1,S2, S3, S6, S9 and S10 must have minimum diameter of 30 mm of enclosed airframe for at least 50% and for Class S5 for at least 20% of the overall body length. In case of Class S1 the smallest body diameter must be not less than 18 mm for at least 75% of the overall length of each stage, including their back sections. No boat tails or reducers are allowed unless they meet this requirement.

8.2.4.4. Minimum dimensions of subclasses of classes S1, S2, S3, S5, S6, S9 and S10 must not be less than:

Event Class	Minimum diameter (mm) (for at least of 50 % of the overall length and 20 % for S5)	Minimum overall Length (mm)
A	40	500
B	40	500
C	50	650
D	60	800
E	70	950
F	80	1100

8.2.4.5 Design and construction shall include attached surfaces that will provide aerodynamic stabilising and restoring forces necessary to maintain a substantially true and predictable flight path. If required by safety officers or judges, the builder of the model must present data regarding the locations of the centre of gravity, centre of pressure, gross weight, burnout weight, and/or calculated or measured flight performance of the model.

8.2.4.6 A space model shall not contain any type of explosive or pyrotechnic payload.

8.2.4.7 In classes S4, S8 and S10, the minimum weight of the gliding portion of the model that returns to ground in stable gliding flight supported by aerodynamic lifting surfaces, shall not be less than 30% of the maximum specified weight for the particular subclass.

8.3 SPACE MODEL ENGINE STANDARDS

A space model engine which shall supply the propulsive force for a space model must conform to the following standards:

8.3.1 DESCRIPTION

8.3.1.1 A space model engine shall be a solid propellant reaction engine which has all propellant ingredients preloaded into the casting in such a manner that they cannot easily be removed. Delay trains and ejection charges may be pre-mixed and packaged separately if the auxiliary package is a single, preassembled unit containing all of the remaining combustible material.

8.3.1.2 All space modelling events shall be divided into sub-classes according to total impulse as follows:

Event Class	Total Impulse
A/2	0 to 1.25 Newton-Seconds (NS)
A	0 to 2.5 Newton-Seconds (NS)
B	2.51 to 5.00 NS
C	5.01 to 10.00 NS
D	10.01 to 20.00 NS
E	20.01 to 40.00 NS
F	40.01 to 80.00 NS

Note: A/2 models shall have 30 mm in diameter and will be 350 mm long. They will be used mainly for teaching beginners and for their practice.

8.3.1.3 Total impulse of a single engine is equal to the upper limit of the total impulse for the engine class.

8.3.1.4 In space modelling competitions usage of engines of the following total impulse is allowed:

Engine	Class Total Impulse
A/2	1.25 Ns
A	2.50 Ns
B	5.00 Ns
C	10.00 Ns
D	20.00 Ns
E	40.00 Ns
F	80.00 Ns

8.3.2 CASING

A space model engine casing shall be made of non-metallic material of low thermal conductivity. The temperature of the external surface of the casing shall not exceed 200 degrees Centigrade during or after operation. Minimum casting diameter shall not be less than 10 millimetres.

8.3.3 INTERNAL OVERPRESSURE

A space model engine must be so designed and constructed that it will not rupture its casing in the event of internal overpressure. Any malfunction resulting in internal overpressure should dissipate its force along the longitudinal axis of the engine.

8.3.4 SPONTANEOUS IGNITION

A space model engine must be so designed and constructed as to be incapable of spontaneous ignition in air, in water, as a result of physical shocks, jarring, impacts or motion under conditions that would reasonably be expected to occur during shipment, storage or use, or when subjected to a temperature of 80 degrees Centigrade or less.

8.3.5 LOADING, THRUST AND IMPULSE

A space model engine shall contain less than 125 grams of propellant material. It must not produce a total impulse of more than 100 Newton-seconds and must have a thrust duration longer than 0,050 seconds.

8.3.6 STORING AND SHIPPING

A space model engine shall be shipped and stored with no ignition element installed that may be actuated by an open flame, a temperature of less than 150 degrees Centigrade, or by incident radiofrequency radiation normally encountered during shipping, storage and use.

8.3.7 SEALING

A space model engine containing more than 20 grams of propellant materials shall be sealed at the factory with a non-metallic seal in the nozzle and in the forward end. These seals should be readily removable by the user unless the engine is designed to perform its function with the seals in place.

8.3.8 BURNING

A space model engine in operation shall expel from its nozzle no pieces of burning propellant and shall be incapable of igniting a piece of dry paper or grass at a distance of one metre or more from the nozzle of the engine.

8.3.9 MODIFICATIONS

A space model engine shall not be altered in any manner to change its published and established performance characteristics or dimensions.

8.3.10 CERTIFICATION FOR FAI CONTESTS

A space model engine used in a space model in FAI competition or for the purpose of establishing or surpassing FAI space model performance records shall be of a type previously tested and certified for such use by an FAI representative National Airports control.

8.3.10.1 Competitors or team managers must submit to the competition Organiser in advance of the competition the aero club certification documents of all engine types to be used

during the competition. These certification documents must include data on engine dimensions, loaded weight, propellant weight, total impulse, thrust time curve, and time delay. The certification documents must contain an affidavit stating that the space model engine type meets all FAI standards as set forth in these rules.

8.3.10.2 In World and Continental Championships the competition organisers must perform a static test on a random sample of each engine type to check the data submitted by a National Airsports Control. When engine testing is completed, engine testing officers shall produce a certificate that contains data specified in 3.10.1 and in addition to them: the date, venue, competition name, names of engine testing officials and type of engine tester. This certificate shall be signed by engine testing officers and the Organiser's authority, and stamped and may be used as a certificate similar to that in 3.10.1.

8.3.11 STATIC TESTING

Static testing by an FAI representative Airsports Control may be carried out by the club or by an organisation designated by the club. In all cases, the FAI representative Airsports Control shall be responsible for the accuracy and correctness of all test data.

Copies of the test results should be at their request be given to the team managers of the competing countries.

Engines must be submitted in batches for testing. Batch is defined as the engines required for one engine class in an event regardless of delay length. Maximum three batches are allowed per engine class per an event. In case of failure of any engine in the batch or if the total impulse of the engine class is exceeded, the entire batch will be rejected.

8.3.12 STATIC TEST EQUIPMENT

Static test equipment utilised for FAI certification of space model engines shall meet the following specification:

8.3.12.1 Engine thrust will be measured with the engine in horizontal position. Thrust shall be measured and recorded to an accuracy of +/- 1% of the full scale for the particular measuring range. Absolute measurement error shall not exceed +/- 0,05 N while testing engines up to 5 Ns during burning and delay time.

8.3.12.2 Thrust duration will be measured and recorded to an accuracy of +/- 0,01 sec.

8.3.12.3 Frequency response of the equipment shall be at least 100 Hertz, and the natural frequency of the equipment shall be at least 5 times this number, or 500 Hertz.

8.3.12.4 Time delay shall be measured and recorded to an accuracy of +/- 0,1 seconds.

8.3.13 SPACE MODELS ENGINE TESTING STANDARDS

A space model engine type may be certified by an FAI representative National Airsports Control if the performance of a randomly selected sample meets the following standards:

8.3.13.1 The total impulse of any individual engine tested should not depart more than + 0% / - 20% from the established mean value for that engine type.

8.3.13.2 The time delay of any individual engine tested should not depart more that +/- 20% from the established mean value to the engine type, and this variation for any engine should not exceed +/- 3 seconds.

8.3.13.3 No engine tested should malfunction in any manner.

8.3.13.4 Static tests shall be conducted with the test engine at a temperature of 20 degrees Centigrade, +/- 5 degrees Centigrade.

8.3.14 TYPE IDENTIFICATION

All space model engines accepted for use in an FAI competition shall be plainly marked on their exterior by the manufacturer at the time of manufacture with markings or codings indicating the engine's type and/or performance. Colour coding of the nozzle end of the casting indication type is recommended.

8.3.12.2 Thrust duration will be measured and recorded to an accuracy of +/- 0,01 sec.

8.3.12.3 Frequency response of the equipment shall be at least 100 Hertz, and the natural frequency of the equipment shall be at least 5 times this number, or 500 Hertz.

8.3.12.4 Time delay shall be measured and recorded to an accuracy of +/- 0,1 seconds.

8.4 GENERAL RULES FOR INTERNATIONAL CONTESTS

See Section 4b, of Volume ABR of the Sporting Code for details. Moreover the following additions apply:

8.4.1 WORLD CHAMPIONSHIP EVENTS for SPACE MODELS

The following events are recognised (2001) as World Championships for Space Models:

i) W/CH for Senior classes:

- a) altitude models – S1B
- b) parachute duration models – S3A
- c) boost glider duration models – S4A
- d) scale altitude models – S5C
- e) streamer duration models – S6A
- f) scale – S7
- g) rocket glider duration and precision landing models – S8E/P
- h) gyrocopter duration models – S9A

ii) W/CH for Junior classes:

- a) altitude models S1A
- b) parachute duration models – S3A
- c) boost glider duration models – S4A
- d) scale altitude models – S5B
- e) streamer duration models – S6A
- f) scale – S7
- g) rocket glider duration models – S8D
- h) gyrocopter duration models – S9A

8.4.2 NUMBER OF MODELS

The number of models eligible for entry is as follows:

Class S1A, B, C, D, E, F	Two (2) only
Class S2C, E, F	Two (2) only
Class S3A, B, C, D.	Two (2) only
Class S4A, B, C, D, E, F	Two (2) only
Class S5A, B, C, D, E, F.	One (1) only
Class S6A, B, C, D.	Two (2) only
Class S7	One (1) only
Class S8A, B, C, D, E (E/P), F	Two (2) only
Class S9A, B, C, D	Two (2) only
Class S10A, B, C, D.	Two (2) only

For classes S3, S4, S6, S8, S9 and S10 one (1) additional model may be processed and flown by the competitor on there being a tie for first place at the end of the third round.

8.4.3 LAUNCHING

8.4.3.1 Organisation

During all operations concerned with the launching and flight of space models, all authority for the safety and conduct of operations on the flying field shall be vested in a range Safety Officer who must be a member of an FAI Representative Aero Club and who must be 18 years of age or more. Deputy Range Safety Officers who meet the above qualifications may have this authority delegated to them by appointment from the Range Safety Officer, but this delegation or partial authority does not relieve the Range Safety Officer of overall responsibility and authority on the flying field.

Adequate opportunity and facilities will be provided so that all competitors in each event at a competition may obtain engines and prepare their models simultaneously for flight under the observation of officials.

8.4.3.2 Flight Permission

All space models presented for operation on the flying field shall be permitted or denied flight by the Range Safety Officer or his duly authorised deputy on the basis of his considered judgement with respect to the possible safety of the model in flight.

8.4.3.3 Launching Device

A launching device or mechanism must be used that shall restrict the horizontal motion of the model until sufficient flight velocity shall have been attained for reasonably safe, predictable flight. A launching angle of more than 60 degrees from the horizontal must be used.

8.4.3.4 Assisted Launch

A launcher must not impart to the model any velocity or change of momentum except that caused by the space model engine(s) contained in the model. A launch assisted by mechanical devices built into the launcher shall not be allowed.

8.4.3.5 Launching Procedure

Launching or ignition must be conducted by remote electrical means at a safe distance that depends on the space model class, weather conditions and number of spectators. It shall be announced by the Range Safety Officer before the beginning of competition in a particular class of the model and must be fully under the control of the person launching the model. All persons in the vicinity of the launching must be advised that a launching is imminent before a space model may be ignited and launched, and a minimum five (5) second "count down" must be given before ignition and launching of a space model.

8.4.3.6 Weather Conditions

See General Rules for International Contests, Para B.13.1 and B.14.1..

8.4.3.7 Hazard

A space model in flight shall not create a hazard to aircraft and shall not be used as a weapon against ground or air targets.

8.4.3.8 Thermal Creation and Detection

No mechanical or passive methods of thermal creation are permitted (waving jackets, spreading reflective sheets, hot air blowers, motorcycles, etc.)

Ground or tethered thermal detection is permitted as long as it does not interfere with the conduct of the competition as determined by the FAI Jury.

8.4.4 OFFICIAL ENTRIES

8.4.4.1 Entry

Before the first flight in any competition event, at least one model must be inspected and marked by the judges. The next model can be inspected during the competition event. Two or more competition events may not be flown simultaneously by the same model.

8.4.4.2 Model Marking and Identification

Each entry shall carry, prominently displayed upon its body, fins, or other exterior part, the competitor's FAI license number in letters and numbers approximately one (1) centimetre high. The name, national insignia, or international identification mark (see Section 4b, Annex B.2) of the competitor's nation must be displayed on the exterior of the model.

A light coloured area of minimum dimensions 1 cm by 3 cm must be provided for the organiser's processing mark.

8.4.4.3 Builder of the Model

The judges shall make every reasonable effort to insure that each competitor has completely constructed the model entered in the competition with "construction" to be interpreted as the action required to complete a model starting with no more prefabrication than the amount used in the average kit. Models that are completely prefabricated or require only a few minutes of unskilled effort for their completion shall be excluded from competition. Materials and design may be obtained from any source, including kits.

8.4.5 OFFICIAL FLIGHTS

8.4.5.1 Definition of an Official Flight

A flight is considered official if the model or any part of the model leaves the launching device, loses contact with the launching device after ignition, or becomes airborne, except in the case of a catastrophic failure according to the provisions of Rule 4.6.3., in which case the flight is not considered official.

8.4.5.2 Number of flights

In each event, except Scale (S7), each competitor shall be given an opportunity to make three (3) official flights, time and weather permitting. In Scale (S7) two (2) opportunities will be given, time and weather permitting.

8.4.5.3 Definition of an Unsuccessful Attempt

An attempt is classed as unsuccessful if the model or any part of the model leaves the launching device and at least one of the following events occur:

- a) model collides with another model during the flight,
- b) proven frequency interference for radio controlled models,

- c) catastrophic failure according to the provisions of the rule 4.6.3,
- d) "no close" or "track lost" for altitude models.

If this happens on the first attempt then the competitor is entitled to the second attempt.

8.4.6 DISQUALIFICATION

8.4.6.1 Judges may disqualify any model at any time which, in their opinion, does not comply with the competition rules or which the Range Safety Officer or his authorised deputy feels may not be reasonably safe in operation.

8.4.6.2 Judges may disqualify any competitor on the grounds of failure to practice or observe reasonable safety measures, published or otherwise, for poor sportsmanship, for failure to abide by the orders of the Range Safety Officer or his authorised deputy or for misconduct on general.

8.4.6.3 A model experiencing a catastrophic failure which, in the opinion of the judges, was not due to or caused by improper design, construction, or pre-flight preparations of the model, shall not be disqualified from competition. A model suffering such a catastrophic failure and thereby rendered incapable of additional flights may be replaced by another model. For Scale models S5 and S7, experiencing a catastrophic failure, see rule 9.12.

8.4.6.4. By reason of flight characteristics, a model may be disqualified for a flight but is not necessarily disqualified for the entire event.

8.4.7. RADIO CONTROLLED SPACE MODELS

8.4.7.1. For transmitter and frequency control see Volume ABR, Section 4b, paragraph B.10.

8.4.7.2. Competitors must be called at least five minutes before they are required to occupy the starting area.

8.4.7.3. Once the competitor has been given permission to start, he may delay no longer than one minute before attempting launching.

8.4.7.4. The competitor has to have ability to fly on at least two frequencies.

8.4.8. TIMING AND CLASSIFICATION

8.4.8.1. See Section 4b, para B.12.

8.4.8.2. The timing of flights is limited to a maximum determined by the individual class and size of engine used. The total flight time is taken from the model's first motion on the launching device to the end of the flight.

8.4.8.3. The total time of the three flights of each competitor is taken for the final classification.

8.4.8.4. In order to decide the winner when there is a tie, additional deciding flights shall be made immediately after the last flight of the event has been completed. The maximum time of flight in each additional round shall be increased by two (2) minutes on the maximum time of flight of the previous round. There shall be only one attempt for each additional flight. The times of the additional flights shall not be included in the final figures of classification for teams, they are for the purpose of determining the winner and for awarding the prizes attached to the title. The organiser will decide the time during which all competitors must launch their models. In the case of a tie in the team classification, the best individual score (classification) will be used.

There shall be no more than two fly-off rounds to determine the winner. The second fly-off round will be timed to the completion of the flight for final results.

8.4.8.5. For World and Continental Championships a round is defined as the amount of time allocated by the organiser for a national team to prepare and launch their models for one official flight per team member (one hour is recommended).

8.4.9. ALTITUDE DATA

For measuring and calculating altitudes may be used the method based on the principles of triangulation, the method of electronic or radar tracking or the method based on calculation of the height where the horizontal distance of tracking lines of pairs of stations in space achieves their minimum.

8.4.9.1 Triangulation Method

8.4.9.1.1 Tracking

All models in any event for which an achieved altitude figure is scored shall be tracked in flight be at least two (2) calibrated measuring devices which are situated on a measured baseline of at least three hundred (300) metres. The distance to the launch pad shall be a minimum of 2/3 (two thirds) of the current world record rounded to the nearest lower 100 metres.

At world championships, a redundant tracking system shall be implemented with four measuring devices (Theodolites), two at each tracking station. The best tracking pair will be designated as the primary trackers and their data will be used first. If the primary trackers fail, the data from the secondary trackers will be used. If they fail, the combination of azimuth and elevation from each tracking station will be used.

For models with engines over 20 Newton-seconds the base line must be a minimum of 450 metres. The distance from the launch site to the centre line of the base line must be 1/2 the base line length.

The distance to the launch pad shall be at least 300 m for models with up to 2,5 Ns impulse. The launch site must be seen from the measuring devices.

8.4.9.1.2 Tracking Accuracy

The measuring devices must be able to measure angles in both the horizontal (azimuth) and vertical (elevation) axes and shall have a minimum accuracy of +/- 0,5 degrees in both azimuth and elevation.

8.4.9.1.3 Tracking Procedure

A model for which an achieved altitude figure is required will be tracked aloft visually by measuring device operators manning each tracking device until they see that the model has reached the maximum vertical altitude of its flight. The angle of azimuth from the baseline and the angle of elevation from the horizontal shall then be read to the nearest degree of arc and reported to the launching area.

Angular data thus recovered from tracking will be reduced to altitude data by use of the principles of triangulation.

8.4.9.1.4 Computed Altitude

The computed altitude from each station's reduced altitude data must be within ten percent (10%) of the average altitude computed utilising data from both stations. Computed station altitudes not falling within 10% of the average computed altitude will result in a "no close" (NC) for the model. All altitudes will be rounded-off to the nearest

metre before this "10% rule" is applied. The official scored altitude is the computed average altitude.

A "Track Lost" (TL) is recorded where the trackers are unable to determine the position of the model sufficiently to obtain any angles.

A zero is recorded if the flight path is erratic, unpredictable, malfunctions or the flight is disqualified for safety reasons.

In the event of a "No Close" (NC) or a "Track Lost" (TL) for the model, the competitor may be allowed to fly again until the end of the round. The organiser is obliged to announce altitude calculations of each flight not more than ten minutes after the launch, to leave modellers whose flights are considered "No Close" (NC) or "Track Lost" (TL) enough time to make another flight in the same round. A safety disqualification or a model malfunction making the model difficult to track will result in a "zero" for the flight.

8.4.9.1.5 Visibility of Models

All models that are to be tracked for altitude shall disperse a coloured powder at ejection which will aid tracking. Theodolite operators may lose track of models which do not contain sufficient powder or contain powder which does not contrast well with the sky. The organiser will have tracking powder available for competitor's use.

8.4.9.2 Electronic or Radar Tracking

Altitude data derived from electronic or radar devices is valid only if evidence is presented regarding proper calibration and correction.

4.9.2.1 Electronic altitude measurements

Electronic altimeter carrying requirements and application:

- (a) An electronic altimeter carried in a space model shall be completely enclosed and contained within the model, so as to be removable. It shall not be capable of separating from the model in flight.
- (b) An electronic altimeter shall fulfil the following technical specifications:
 - Must use barometric measurement technique.
 - Must record, as the flight altitude, the difference between peak altitude achieved and the altitude of the pad from which it was launched.
 - Have a data readout resolution of 1 metre or better.
 - Have a measurement accuracy of 2% of the recorded altitude or 2 metres, whichever is greater.
 - Have a data sampling rate of 10 samples per second or greater.
 - Give the data readout of peak altitude by audio or visual means directly from the altimeter, with no external device required.
 - Must be capable of being completely cleared of all previous flight data before flight.
- (c) The technical specifications of this equipment and container shall be announced in the local rules for each altitude contest.
- (d) All electronic altimeters shall be impounded before the start of the event, kept safe by an official and checked and calibrated by the judges, or a qualified calibrating team, equipped with the relevant electronic equipment.

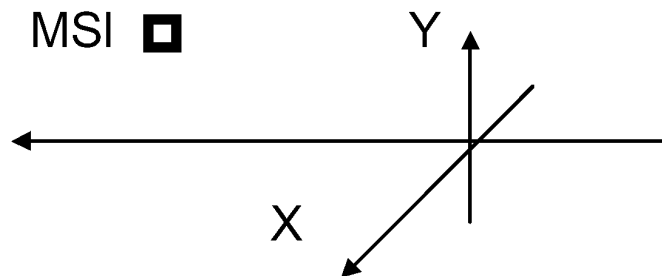
- (e) Competitors shall take checked and calibrated electronic altimeters from the pound and mount them on the model under the supervision of the judges. The competitor shall return the electronic altimeter to the judges as soon as possible after the flight has finished for readout data and recheck or recalibration if the judges find that necessary.

4.9.2.2. Radar Altitude Measurements

Subject to the radar equipment to be used for radar altitude measurements, the organiser of the event shall announce a special request for the type of reflective surface or responders to be used in a particular event.

8.4.9.3 Minimum Horizontal Distance Method (S1X Method)

8.4.9.3.1. Definitions



Co-ordinates:

Degree: Angle of 1/360 of a circle

Launch Position: Point on the launch site in the near of the launching pads, defined by the judge.

Measure Station: What ever includes a measuring device.

Station Position: Space co-ordinates of a Measuring Station (MS) relative to the launch position, where the Measuring Station 1 (MS1) has co-ordinates $X = 0$, $Z =$ Horizontal Distance to the launch position (LP).

$Y =$ Vertical difference to the launch position

Tracking: Searching the powder cloud ejected by a model.

Track Line: Line defined by the station position (SP) and the horizontal and vertical angles, measured by a measuring station for a flight.

Station Pair: Two measuring stations, which measured angles and positions will be computed to a PairResult. All possible combinations of measuring stations will be used as Station Pairs (eg: 5 Measuring-Stations will get 15 Station Pairs).

PairResult: Height, where the horizontal distance between the Track Lines of a Station Pair achieves the minimum, rounded down to metres.

Altitude Point: Point defined by the space co-ordinates of the middle-point of the horizontal distance-line between the Track Lines of a Station Pair in the height of the PairResult.

Pair Error:	Average of differences between the measured angles by the Measuring Stations of a Station Pair and the respectively angles from Station Positions to the Altitude Point, rounded down to degrees.
Flight Result:	Average of considered PairResults, rounded down to metres.
Flight Error:	Average of differences between Flight Result and PairResults in percent of the Flight Result, rounded down to percents.

8.4.9.3.2. Validations

A PairResult is valid, when the Pair Errors in horizontal and vertical directions are both not greater than 5 degrees. The minimum number of valid PairResults for record attempts is 5.

If for a flight are calculated more than 3 valid PairResults, the results of the Station Pairs with the minimum and the maximum height will be ignored.

The Flight Result is valid, when the Flight Error is not greater than 10%.

8.4.9.3.3. Accuracy of Measuring Devices

The measuring devices shall have a minimum accuracy of ± 5 degrees in the horizontal (azimuth) and ± 1 degree in the vertical (elevation).

8.4.9.3.4 Number of Measuring Stations

During an ordinary contest must be work at least three (3) calibrated measuring devices. At world championships and for record attempts the minimum of measuring devices is 5.

8.4.9.3.5 Position of Measuring Stations

The distance between Measuring Stations and the Launch Position must be at least 50 metres. The minimum distance between Measuring Stations is 100 metres. The Launch Position must be seen from every Measuring Station.

8.4.9.3.6. Communication between Judge and Measuring Stations

The judge must get a sign of readiness from every Measuring Station and transmit number of stages and colours of powder before beginning the count down. Transmitting any information about the competitor is prohibited. The judge must transmit immediately to the Measuring Stations when the ejected cloud will be visible.

8.4.9.3.7. Disqualification

If neither the judge nor any Measuring Station saw an ejected cloud, the flight will be disqualified. In other cases where the Flight Result is invalid, the flight is TrackLost and the competitor has a chance for a new attempt during the same round whenever he is ready for a new attempt. Disqualifications and TrackLosses must be published immediately.

8.4.9.3.8 Computer Calculation

The FAI will make available computer programmes for altitude calculations based on the described method for MS-Windows environment to every National Airsports Control free of charge. Interested National Airsports Controls can get the source programmes for developing their own versions if they make the new programme also available to the FAI and all other National Air sports Controls free of charge.

8.4.9.2.9. Documentation

The official result of a contest must include data of the positions of Measuring Stations relative to the defined LaunchPosition, angles measured by every Measuring Station for every flight, PairResults and Pair Errors, Flight Results and Flight Errors as well as the highest Flight Results of the competitors, so that everybody can verify calculations.

8.5 ALTITUDE COMPETITION (CLASS S1)

8.5.1. DEFINITION

In any altitude competition event, the model achieving the highest maximum altitude as tracked and reduced shall be declared the winner.

8.5.2. ALTITUDE DATA

ALTITUDE DATA rules 4.9 will be used for this competition.

8.5.3. SUB-CLASSES

Altitude competition shall be divided into classes based upon the maximum allowable gross launching weight of the model and the maximum permissible total impulse of the engine or engines powering the model. Any number of engines may be used in any arrangement provided that the sum of the total impulses of the individual engines does not exceed the allowable total impulse maximum for the competition class.

The following event classes are in effect for altitude competition:

CLASS	TOTAL IMPULSE	MAXIMUM WEIGHT
	(Newton-seconds)	(g)
S1A	0,00 - 2,50	30
S1B	2,51 - 5,00	60
S1C	5,01 - 10,00	120
S1D	10,01 - 20,00	240
S1E	20,01 - 40,00	300
S1F	40,01 - 80,00	500

8.6 PAYLOAD COMPETITION (CLASS S2)

8.6.1. DEFINITION

This event is open to models that carry one or more standard FAI space model payloads to the highest altitude as tracked and reduced.

8.6.2. STANDARD FAI PAYLOAD SPECIFICATION

The Standard FAI space model payload is a solid cylinder of either lead (Pb) or an alloy of lead containing no less than 60% lead by weight and weighing no less than 28 grams. This cylinder shall be 19,1 +/- 0,1 mm in diameter. No holes may be drilled or punched into it, and no other material may be affixed to it.

8.6.3. PAYLOAD CARRYING REQUIREMENTS

The standard FAI space model payload or payloads carried in a model shall be completely enclosed and contain within the model, shall be removable from the model, and shall not be capable of separating from the model in flight.

8.6.4. MODEL RECOVERY REQUIREMENTS

Models in this event must contain for recovery purposes parachutes of sufficient size to allow a safe landing under the provisions of Paragraph 2.4.1.

8.6.5. DISQUALIFICATION

A model's official flight will be disqualified if the payload separates during flight or landing and thereby becomes separated from the model.

8.6.6. ALTITUDE DATA

ALTITUDE DATA rules 4.9 will be used for this competition.

8.6.7. SUB-CLASSES

This competition will be divided into classes based upon maximum allowable gross launching weight, number of standard FAI space model payloads carried, and maximum permissible total impulse of the engine or engines. The following classes of FAI space model payload competition are established:

CLASS	TOTAL IMPULSE (Newton-seconds)	MAXIMUM WEIGHT (g)	NUMBER OF PAYLOADS CARRIED
S2C Single	5,01 - 10,00	90	1
S2E Dual	20,01 - 40,00	180	2
S2F Open	40,01 - 80,00	500	4

8.7 PARACHUTE/STREAMER DURATION COMPETITION (CLASSES S3 AND S6)

8.7.1. GENERAL

The Parachute or Streamer Duration Competition is divided into classes according to the total impulse of the engine used. During the flight no part of the model other than parachute protectors or wadding may be detached or jettisoned.

8.7.2. SPECIFICATIONS

8.7.2.1. Parachute Duration Models

The Parachute Duration Competition is open to models that are single-staged, powered by a single space model engine, containing one or more parachutes for recovery purposes. The parachute(s) must be provided with a minimum of three (3) shroud lines. A competitor may change the recovery parachute(s) in a model at any time during the competition.

8.7.2.2. Streamer Duration Models

The Streamer Duration Competition is open to models that are single-staged, powered by a single space model engine, containing one streamer for recovery purposes. The streamer must be a single homogenous unperforated rectangle of flexible material i.e. fabric, tissue or plastic foil with a length to width ratio of 10:1 minimum. At the narrow end of it a rigid support of 2 mm x 2 mm maximum crosssection together with a loop of thread attached at each end of the support may be used to attach the streamer to the model's single shroud line. The streamer must completely unfurl during the flight. A competitor may change the streamer in a model at any time during the competition.

8.7.3. TIMING AND CLASSIFICATION

Timing and Classification Rules 4.8 will be used for this competition.

8.7.4. SUB-CLASSES

For Parachute and Streamer Duration Competitions the classes and their respective maximum flight

tines are:

CLASS	TOTAL IMPULSE (Newton-seconds)	MAXIMUM WEIGHT(g)	MAXIMUM PARACHUTE (sec)	FLIGHT TIME STREAMER (sec)
S3A/S6A	0,00 - 2,50	100	300	180
S3B/S6B	2,51 - 5,00	100	420	240
S3C/S6C	5,01 - 10,00	200	540	300
S3D/S6D	10,01 - 20,00	500	660	360

8.8 BOOST/GLIDE DURATION COMPETITION (CLASS S4)

8.8.1. DEFINITION/DESCRIPTION

This competition comprises a series of events open to any free flight space model that ascends into the air without use of lifting surfaces which sustain the entry against gravity during that portion of flight when it is being subjected to or accelerated by thrust from its space model engine; and that returns its glider portion to the ground in stable gliding flight supported by aerodynamic lifting surfaces which sustain the portion against gravity. The intent of this competition is to provide a sporting competition for space models with gliding recovery. Space models that ascend into the air in a spiralling climb under rocket power in such a manner that they are supported during their rise by wings shall not be eligible for entry in this competition.

Any model that qualifies as a flex-wing (Rogallo) rule 13.1.1 is not eligible for this event.

Any model that qualifies as a radio controlled model rule 11.5 is not eligible for this event.

8.8.2 PURPOSE OF COMPETITION

The purpose of the competition is to determine which model achieves the longest time of flight utilising a vertical or near vertical free-ballistic flight pattern under power within a 60 degree cone centred vertically on the launcher and a stable aerodynamic glide recovery. Each model will be timed from the instant of first motion on the launcher until the instant the gliding top portion touches the ground.

8.8.3. TIMING AND CLASSIFICATION

Timing and Classification Rules 4.8 will be used for this competition.

8.8.4. SUB-CLASSES

For Boost/Glider Duration Competitions the classes and their respective maximum flight times are:

CLASS	TOTAL IMPULSE (Newton-seconds)	MAXIMUM WEIGHT (g)	MAXIMUM FLIGHT TIME (sec.)
S4A	0,00 - 2,50	60	180
S4B	2,51 - 5,00	90	240
S4C	5,01 - 10,00	120	300
S4D	10,01 - 20,00	240	360
S4E	20,01 - 40,00	300	360
S4F	40,01 - 80,00	500	360

8.9 SCALE COMPETITION (CLASS S7)

8.9.1. DEFINITION

Scale competition is a single event and is limited to flying space models that are true scale models of existing or historical guided missiles, rocket vehicles, or space vehicles.

8.9.2. MULTI-STAGE PROTOTYPE

If the entry is a scale model of a multi-staged vehicle, it may be designed so that one or more of the upper stages are inoperable dummies. However, the upper stage of a multi-staged vehicle may not be entered and flown without its operable lower stages unless specific data is furnished to the judges to prove that the upper stage configuration was designed to be or has flown separately, alone, and as vehicle itself. For example, all Aerobee rockets must have operable boosters.

8.9.3. SELECTION OF PROTOTYPE

The competitor must have modelled one particular serial-numbered prototype, except in the case where the prototype is in such large mass production that there is no single individual vehicle that can be singled out for scale modelling purposes. However, the competitor shall make every reasonable attempt to model a specific prototype.

8.9.4. PROOF OF SCALE

The competitor must supply scale data to substantiate his model's adherence to scale in dimension, shape, colour, and point pattern. Minimum allowable data consists of length and diameter of the prototype and one photograph. Further data is certainly encouraged. Dimensional data must be from an accurate source such as magazines, books, manufacturer's specifications or data sheets, etc. Photographs from any sources are acceptable. All data presented should apply to the particular prototype that is modelled and entered. Judges may deduct points for incorrect data.

8.9.5. KITS

Flying scale space model kits may be used as a source of design, materials, etc. and acceptable for entry only if accompanied by scale substantiation data other than that contained in the kit or available from the kit manufacturer. The competitor shall be responsible for ascertaining the correct scale qualities of the kit and must present satisfactory evidence that the kit model is correct to scale.

8.9.6. STABILISING FINS

Scale models of rockets, missiles or space vehicles that are not fin-stabilised may be fitted with transparent plastic fins so as to make the model stable in flight while detracting the least from the scale qualities of the model

8.9.7. PLASTIC MODEL KIT PARTS

Parts from plastic model kits may be used on scale space models provided that this use is pointed out in the data presented with the model at the time of judging for scale qualities.

8.9.8. CONDITIONS OF MODEL FOR JUDGING

Models will be judged for scale qualities in flight condition minus space model motors. All clear plastic fins, launching lugs, and fittings and other flight items must be attached to the model for scale judging. Nothing may be added to or taken off the model between the scale judging and the flight except space model motors and recovery device packing.

8.9.9. MAXIMUM WEIGHT AND IMPULSE

Maximum allowable gross launching weight is limited to 1000 grams.

Maximum allowable total impulse is 160,00 Newton-seconds. Maximum engine size allowed is 80 Newton-seconds.

8.9.10. NUMBER OF FLIGHTS

Each entry must make a stable flight, and two (2) opportunities will be available to the competitor for this purpose, time and weather permitting.

8.9.11. SCALE JUDGING

Scale quality points will be awarded to each entry according to the following schedule:

8.9.11.1. A competitor who presents the following proper technical data may be awarded a maximum 50 points:

- authentic, authorised drawing(s) of the prototype with at least ten dimensions and three cross sections, i.e. data which define colour of cross sections and markings on it;
- workshop drawing of scale model - scale 1:1;
- at least one colour photograph of the whole prototype with clearly visible details of colour and markings;
- at least three photographs of details and assemblies;
- file containing all necessary technical data.

8.9.11.2. Adherence to scale:

250 points maximum.

To be considered as a scale model the dimensions of the body diameter, overall length, overall fin span (if finless, use body length) should not depart from scale by more than 10% or else the model is disqualified.

The judging category should be judged in three areas:

- 1) body and nose cone 125 points maximum;
- 2) fins 75 points maximum;
- 3) colour and markings 50 points maximum.

This rule shall not be applied to dimensions less than 5 millimetres

For models with clear plastic fins see Annex 9, Cat. Scale Adherence, Sub-Cat. Fins

8.9.11.3. Workmanship:

350 points maximum.

To be judged on neatness, care of construction, and degree of finish. The judging category will be judged in two areas: Workmanship of nose cone, body, fins and details: 200 points maximum and Finish of nose cone, body and fins 150 points maximum. Good workmanship that detracts from scale-such as a high gloss finish on a model that should have a flat or dull finish - will detract from maximum points.

8.9.11.4. Degree of difficulty:

200 points maximum.

To be judged on the degree of difficulty involved in constructing the model. Factors to be considered include symmetry of model. Number of external components, intricacy of paint pattern, degree of detailing, and degree of difficulty in adapting the model for flight conditions.

8.9.11.5. Flight, characteristics:

300 points maximum. To be judged on launch, stability of flight, staging (if any) and recovery. A competitor has to designate which operations his models are to perform in flight (e.g. separation of stages. radio controlled trajectory, ejection of payload, etc.).

If the model has been disqualified in both official flights, the competitor will not be eligible for final classification.

8.9.11.6. In the case of World and Continental Space Modelling Championships dimension deviations from the scale shall be measured by a separate qualified measuring team approved by the FAI Jury. The measured dimensions will be presented to the Scale Judges for verification and included with the Scale Judging Data.

8.9.12. Should the model experience a catastrophic failure, be incapable of additional flights (4.6.3.) and have scored no Flight Characteristic points, the competitor's static scale points will be taken to decide final classification.

8.10 SCALE ALTITUDE COMPETITION (CLASS S5)

8.10.1. DEFINITION

This series of events involves altitude competition with scale space models and is a combination of the altitude competition (Part 5) and the scale competition (Part 9). The objective of the competition is to achieve the highest altitude with a scale space model.

8.10.2. RULES

All entries must comply with the rules of Scale competition (Part 9) and will be judged under the same rules and receive the same number of maximum scale quality points except that three flights will be allowed and no flight characteristics points will be given.

ALTITUDE DATA rules 4.9 will be used for this competition.

8.10.3. SCORING

The total number of scale quality points awarded to an entry will be added to the highest official altitude achieved by the entry. Only in the case of “no close” or “track lost”, no altitude points are added but the flight is considered qualified and the competitor’s static points will be taken to decide the final classification. Otherwise, if the model does not make a qualified flight after three attempts, the final classification will be zero.

The entry having the largest number of total points resulting from adding the static scale quality points to the altitude in metres achieved from the same flight, will be declared the winner. In the event of a tie, the points gained for scale quality will be decisive.

8.10.4. DISQUALIFICATION

The judges must disqualify from scale altitude competition any entry which, in their opinion, does not show sufficient scale qualities or evidence of normal level of workmanship required for a scale model under the provisions of the scale competition (Part 9). The intent of this rule is to eliminate from scale altitude competition any entry which has scale qualities grossly subordinated in favour of altitude performance qualities.

8.10.5. SUB-CLASSES

Scale Altitude Competition may be flown in the following classes:

CLASS	TOTAL IMPULSE (Newton-seconds)	MAXIMUM WEIGHT (g)
S5A	0,00 - 2,50	90
S5B	2,51 - 5,00	120
S5C	5,01 - 10,00	150
S5D	10,01 - 20,00	180
S5E	20,01 - 40,00	240
S5F	40,01 - 80,00	500

CLASS S6A/P - STREAMER TARGET TIME DURATION COMPETITION (FAI PROVISIONAL RULES)

7.5 Class S6A/P – Streamer target time duration competition

7.5.1. Purpose of competition

The purpose of this competition is to achieve, as exact as possible, the target time of 240 sec and to launch the model within the five (5) minutes working time for the relevant group. The model shall be timed from the instant of first motion on the launcher until the instant it touches the ground.

7.5.2. Construction requirement and specification

Models for this class are identical with those in Class S6A – Streamer duration competition. Entry: two models are shall be inspected and marked by the judges for this competition.

7.5.3. Timing and classification

FAI Sporting Code Volume ABR Section 4B paragraph B.12 applies to this competition.

One point will be awarded for each full second of flight time up to a maximum of 240 points (ie 240 seconds a maximum).

The winner of a particular flight in the relevant group receives a score of 1000 points. Other competitors receive points as follows:

$$P_c = 1000 \times \frac{R_c}{R_w}$$

Where:

P_c - points of the competitors

R_w - result of the winner in the relevant group

R_c - result of the competitor

The five competitors with the highest scores after three starts qualify for the final round.

There will be one flight for the group consisting of all the participants of the final round.

The winner of competition will be determined by the result of the final round.

When there is a tie, the best score of the previous rounds shall be used to determine the individual winner. If a tie still exists after this, then the next best score is used and so on until the tie is broken.

7.5.4 Organization of starts

- (a) The competitors shall be combined in groups by draw, to permit 5-7 to fly simultaneously. The draw is organised in such a way that, as far as possible, there are no competitors of the same team in the same group. The flying order of different groups is also established by a draw. A different composition of groups shall be used for each round.
- (b) Each group is entitled to five minutes of preparation time before the starter announces the beginning of the working time. During the preparation time, each competitor shall prepare his models for flight.

- (c) Each group of the competitors has five minutes of working time to attempt one official flight. Each competitor has only two attempts to launch. In the case of the catastrophic failure of the model, caused by the catastrophic failure of the engine, the competitor may launch his second model in the same working time.
- (d) The starting order of the competitors in each group will be determined by the order in which the competitors announce their wish to fly to the Range Safety Officer. In the case of a misfire, the competitor is allowed to repeat the start only after the attempts of the rest of the competitors who were registered for start at the time of his attempt.

8.11 ROCKET GLIDER DURATION COMPETITION (CLASS S8)

8.11.1 GENERAL

8.11.1.1 Rocket Glider Duration Competition comprises a series of events open to any single-staged rigid winged, radio-controlled space model which returns to the ground in stable, gliding flight supported by aerodynamic lifting surfaces which sustain it against gravity. The model must utilise a vertical or near vertical ballistic take-off and a stable aerodynamic glide recovery without any separation or discarding of engine casting(s).

8.11.1.2 Any model that qualifies for flex-wing rules 13.1.1 or 13.2 is not eligible for this event.

8.11.2. PURPOSE

The purpose of this competition is to achieve the longest flight duration times. Model shall be timed from the instant of first motion on the launcher until the instant it touches the ground.

8.11.3. DISQUALIFICATIONS:

- 8.11.3.1. Any entry which, under any circumstances or in any manner, separates into two or more unattached pieces, or discards its engine casing(s) shall be disqualified.
- 8.11.3.2. Any entry that is supported by aerodynamic lifting forces in such a manner that it ascends in a climb not substantially vertical, within a 60 degree cone centred vertically on the launcher while under rocket power shall be disqualified from this competition.
- 8.11.3.3. Any entry that descends with parachute and/or streamer recovery device(s) attached shall be disqualified.
- 8.11.3.4. During the powered phase of flight, spinning or looping of the entry is permitted only around the roll axis or a parallel axis. Entries which spin or loop around the pitch or yaw axis shall be disqualified.
- 8.11.3.5. Any model that qualifies for flex-wing rules 13.1.1 or 13.2 is not eligible for this event.

8.11.4. TIMING AND CLASSIFICATION

Timing and Classification Rules 4.8 will be used for this competition.

For the fly-off in classes S8E and S8F the jury shall determine the maximum time of flight (but not exceeding 30 minutes) for a round according to the meteorological conditions and the character of the flying site. The maximum must be announced before the start of the round.

8.11.5. RADIO CONTROLLED FLIGHT

- a) The models in Class S8 subclasses S8A to S8F must be radio controlled. Rule 4.7 applies.
- b) The pilot shall be disqualified from the flight if he moves away from the area marked by the organiser.

8.11.6. SUB-CLASSES

CLASS	TOTAL IMPULSE (Newton-seconds)	MAXIMUM WEIGHT (g)	MINIMUM WING SPAN (mm)	MAXIMUM FLIGHT TIME (sec)
S8A	0,00 -2,50	60	500	180
S8B	2,51- 5,00	90	650	240
S8C	5,01- 10,00	120	800	300
S8D	10,01- 20,00	300	950	360
S8E & S8E/P	20,01 -40,00	300	1100	360
S8F	40,01 80,00	500	1250	360

11.7. CLASS S8E/P RADIO CONTROLLED ROCKET GLIDER TIME DURATION AND PRECISION LANDING COMPETITION

8.11.7.1. PURPOSE

The purpose of the competition is to achieve as exactly as possible the given time of 360 seconds and to precisely land the model in a specified landing circle of 10 meters radius.

8.11.7.2. SPECIFICATIONS

The competition has only one subclass determined for models which comply with subclass S8E. Total impulse of engine(s) 20,01 to 40,00 is allowed.

The radio shall be able to operate simultaneously with other equipment at 20 kHz spacing. Where the radio does not meet this requirement, the working bandwidth (Maximum 50 kHz) shall be specified by the competitor.

8.11.7.3. LANDING AREA

Before the start of each round the organiser must provide:

- a) An appropriate number of non-extensible measuring tapes marked every one metre. The number will be determined by the maximum number of flyers in a slot.
- b) A landing area consisting of the appropriate number of 10 metre landing circles, laid out square to the wind direction and with the marked landing tapes pinned down at the centre of each circle. The contest director is responsible for determining the direction and layout of the circles. Any changes of indicated landing area are forbidden during the round. The landing area must be located at a place on the field where there is no danger of collision with any person during the landing of the models.

8.11.7.4. TIMING AND CLASSIFICATION

8.11.7.4.1. Section 4b, (General rules) B.12 applies to this competition.

8.11.7.4.2. The model shall be timed from the instant of first motion on the launcher until the instant it touches the ground.

8.11.7.4.3. The timekeepers must remain with a radius of approximately 10 metres from competitors during the flights and time the flights independently of each other. After the landing, the timekeepers must determine the point at which the nose of the model came to rest and award additional points for landing in accordance with 11.7.4.6 provided the claim is justified.

8.11.7.4.4. One point will be awarded for each full second of flight time up to a maximum of 360 points (that is, 360 seconds maximum).

8.11.7.4.5. One point will be deducted for each full second flown in excess of 360 seconds.

8.11.7.4.6. Additional points will be awarded for landing:

When the nose of the model comes to rest within one metre of the centre of the designated landing circle, 100 points will be given. 10 points are deducted from the maximum of 100 points for every further metre from the centre. If the nose of the model lands between marks it is the lower of the marks that counts.

No additional points will be awarded if the landing occurs 390 seconds after the start or if the model lands outside of the designated landing circle. If, on landing, the model hits

the pilot or his helper, or the pilot stops the model, no additional points will be awarded for landing.

For each flight, the total score is compiled by adding points for flight time and additional points for landing.

- 8.11.7.4.8.** The winner of a particular flight in the relating group receives a score of 1000 points. Other competitors receive points as follows:

$$P_c = 1000 \times \frac{R_c}{R_w}$$

where P_c = points of the competitor

R_w = result of the winner in the relating group

R_c = result of the competitor

- 8.11.7.4.9.** The five competitors with the highest scores after three starts qualify for the final round.

There will be one final flight for a group consisting of all participants of the final round. . If there is a frequency conflict, the competitor with the worst score in three qualifying flights must change the frequency of his radio.

- 8.11.7.4.10.** The final classification will be determined by the sum of all flight scores of each competitor.

When there is a tie, the best score of one round shall be used to determine the individual winner. If a further tie occurs, the second best score of one round shall decide the winner.

8.11.7.5. ORGANISATION OF STARTS

- 8.11.7.5.1.** Competitors shall be combined in groups by draw in accordance with radio frequencies used to permit as many flights simultaneously as possible. For this competition, there must be a minimum of three competitors in a group. The draw is organised in such a way that, as far as possible, there are no competitors of the same nation in the same group. The flying order of the different groups is also established with a draw. A different composition of groups shall be used for each round.

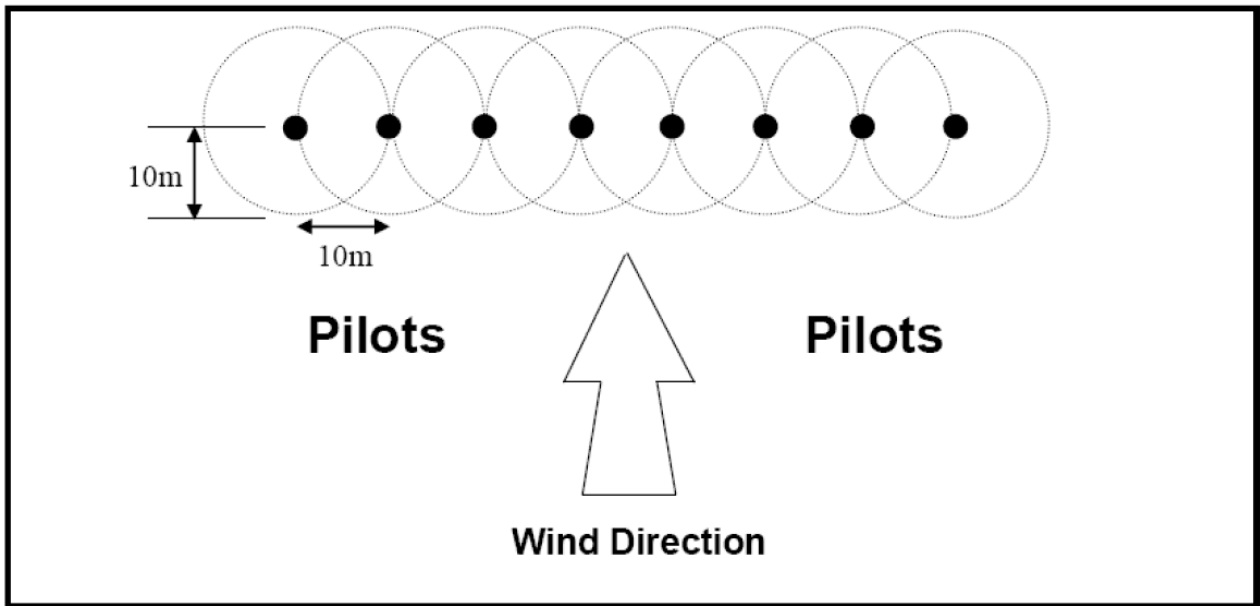
- 8.11.7.5.2.** Each group is entitled to three minutes of preparation time before the starter gives the order to count off the working time.

- 8.11.7.5.3.** Each group of competitors has 14 minutes of working time to collect transmitters from the official, perform an official fight and return the transmitters to the official. In the case of the working time being exceeded (a delay in returning the transmitter to the official), the competitor will be disqualified for the round.

Note: Working time can be repeated at the Contest Director's discretion for any unforeseen reason outside the competitor's control (for example, radio interference). The working time shall be repeated immediately after the end of the current round.

- 8.11.7.5.4.** The starting order of competitors in each group will be determined from the order in which competitors announce their start to the range safety officer. In the case of a misfire, the competitor is allowed to repeat the start only after the attempts of all competitors registered for start at the time of his attempt.

S8E/P LANDING AREA



In normal situations the circles will overlap each other but the centres should never be closer than 5 metres apart. In normal practice, the circle centres should be 10 metres apart as in the diagram above.

8.12 GYROCOPTER DURATION COMPETITION (CLASS S9)

8.12.1. GENERAL

Gyrocopter Duration Competition comprises a series of events open to any single-staged space model which uses the principle of auto-rotation as the sole means of recovery.

8.12.2. PURPOSE

The purpose of this competition is to achieve the longest flight duration using an auto-rotating recovery system.

8.12.3. SPECIFICATIONS

8.12.3.1. Each entry must be decelerated during descent by its auto-rotating recovery device. The resulting autorotation must be around the roll axis of the auto rotating recovery device and must be the result of proper deployment and operation of the recovery system.

8.12.3.2. Flexible materials can only be used for covering rigid support members. The recovery system shall not be constructed solely, or in part, of flexible materials and rigging (e.g., a parachute with rigid stringers or folding rotors of flexible materials between rigid stringers). entries using a recovery system which is designed to act (or which actually acts) in a manner similar to a parachute, a rigid inverted bowl, or similar techniques are specifically excluded from this competition.

8.12.3.3. The entry may not separate into two or more unattached parts, and shall be disqualified if it does so.

8.12.3.4. The 50% requirement of Rule 2.4.3. applies.

8.12.4. TIMING AND CLASSIFICATION

Timing and classification rules 4.8 will be used for this competition.

8.12.5. SUB-CLASSES

CLASS	TOTAL IMPULSE (Newton-seconds)	MAXIMUM WEIGHT (g)	MAXIMUM FLIGHT TIME (sec.)
S9A	0,00 - 2,50	60	180
S9B	2,51 - 5,00	90	240
S9C	5,01 - 10,00	150	300
S9D	10,01 - 20,00	200	360

8.13 FLEX WING DURATION COMPETITION (CLASS S10)

8.13.1. GENERAL:

8.13.1.1. Flex-wing (Rogallo) duration competition comprises a series of events open to any single-staged space model which returns to the ground in stable, gliding flight supported by flexible aerodynamic lifting surfaces which sustain it against gravity.

8.13.1.2. The model must utilise a vertical ballistic take-off and achieve a stable aerodynamic glide recovery without any separation of parts or discarding of engine castings(s).

8.13.2. CONSTRUCTION:

The aerodynamic lifting surfaces must be constructed from flexible materials such as fabric, tissue, or plastic foil. Ribs, spars, stringers, and the remainder of the model may be of any material in accordance with requirements of Rule 2.4. The 50% requirement of Rule 2.4.3 applies.

8.13.3. DISQUALIFICATION

8.13.3.1. Any entry which, under any circumstances or in any manner separates into two or more unattached pieces, or discards its engine casing(s) shall be disqualified.

8.13.3.2. Any entry that is supported by other than flexible aerodynamic lifting surfaces or ascends in a climb not near vertical while under rocket power shall be disqualified from the competition.

8.13.3.3. Any entry that descends with parachute or streamer recovery device(s) attached shall be disqualified.

8.13.4. TIMING AND CLASSIFICATION

Timing and Classification Rules 4.8 will be used for this competition.

8.13.5. RADIO CONTROLLED FLIGHT:

The model may be radio controlled to maintain its flight path in the vicinity of the launch site. Rule 4.7 applies.

8.13.6. SUB-CLASSES

CLASS	TOTAL IMPULSE (Newton-seconds)	MAXIMUM WEIGHT (g)	MAXIMUM FLIGHT TIME (sec.)
S10A	0,00 - 2,50	60	180
S10B	2,51 - 5,00	90	240
S10C	5,01 - 10,00	120	300
S10D	10,01 - 20,00	240	360

8.11 ROCKET POWERED AIRCRAFT AND SPACESHIPS (CLASS S11/P) FAI Provisional Rules

8.11.8.1. Definition:

The Rocketplane or Spaceship competition is a single class which is limited to models which are scale models, resembling the prototype, of rocketplanes or future (futuristic) spaceship (S-F) past or present. The objective is to build a model of a Rocketplane/Spaceship and fly it by radio control. Rule 4.7. applies.

8.11.8.2. Choice of the Model:

The competitor must have produced a genuine rocketplane or spaceship (futuristic or not). However, the competitor shall do his best to reproduce a model from an original subject.

There are two possible subclasses to be chosen:

- a) rocket powered aircraft S11/P (R)
- b) spaceships (futuristic or not) S11/P (S)

8.11.8.2.1. Maximum Weight and Thrust:

Maximum weight (at take-off) 1000 g

Maximum total impulse 160 Newton seconds

Engines up to 80 Ns are allowed.

8.11.8.3. Spaceship with Several Stages:

If the entry is a scale model of a multi-stage vehicle, it may be designed so that one or more of the upper stages are inoperable dummies. However, the upper stage of a multi-staged vehicle may not be entered and flown without its operable lower stages unless specific data is furnished to the judges to prove that the upper stage configuration was designed to be or has been flown separately, alone and as a vehicle itself.

A futuristic spaceship can have several stages. The last stage must be radio-controlled.

8.11.8.4. Stabilisation Flaps:

The rocketplane model (or spaceship) should have the functional radio-controlled control surfaces of the real craft.

8.11.8.5. Kit of Plastic Parts:

Parts from plastic model kits cannot be used.

8.11.8.6. Introduction of the Model for Judging:

Models will be judged for scale qualities in flight condition minus space model motors. All clear plastic fins, launching lugs and fittings and other flight items must be attached to the model for scale judging. Nothing may be added to or taken off the model between the scale judging and the flight except space model motors and recovery device packing.

8.11.8.7. Number of Flights:

Each model must make one stable flight. Two attempts will be accorded to the competitor, time and weather permitting.

8.11.8.8. Judging of the Model:

The models will be judged according to the following rules:

- a) static judging
- b) flight execution

Static Judging:

The competitor will present his model on the top of the launcher. Both launcher and model will be judged according to the following criteria:

8.11.8.8.1 Quality of technical data - max. 50 points

- a) genuine drawings of the prototype
- b) drawings at the same scale as the presented model colour
- c) photographs of the model ready to be launched, in flight and landing.

8.11.8.8.2. Quality of Design - 300 points

- a) level of detail, care given to assembling and degree of finish
- b) fuselage: 100 points
- c) moveable flaps: 100 points
- d) colours and markings: 100 points

8.11.8.8.3 Degree of Difficulty - 400 points

The number of points given will be according to the degree of difficulty encountered during the assembly of the model.

- a) number of external parts: 100 points
- b) complexity of the painting pattern: 100 points
- c) complexity of the design necessary for a flying model: 100 points
- d) launcher: 100 points

Flight Execution

The flight must be in accordance with the following rules, taking off and ascending within a 60 degree conical area; a stable gliding flight; perfect precision of landing on a landing area of 20 m x 5 m (no crash allowed). Each model must fly a stable flight.

8.11.8.8.4 Judging Criteria - 400 points

- a) launching: 100 points
- b) light stability: 100 points
- c) landing quality (no crash, no damage): 100 points
- d) landing precision 100 points in the landing area:

10 points/metre will be deducted for a landing outside the area.

In the case of a major failure caused by an engine malfunction and if the model can not fly again, no points will be given for the flight execution; only the points given for the static judging will be taken into consideration for the final classification.

8.12 TIME DURATION TRIATHLON TOURNAMENT (CLASS S12/P)

8.12.6.1. Definition/Description

Time Duration Triathlon Tournament comprises a series of events open to any single-staged space model which uses subsequently as means of recovery: a) autorotation; b) streamer; c) parachute.

The intent of the competition is to provide the sporting competition which points out versatility of space model design and the skills of the competitors. It combines competitions in autorotation, streamer and parachute descent with a same single model, by changing the means of recovery in subsequent rounds respectively.

8.12.6.2. Purpose

The purpose of this competition is to achieve the longest flight duration using different recovery systems with the same model: a) autorotation; b) streamer c) parachute.

8.12.6.3. Specifications

Model specifications must be in compliance with the provisions of paragraphs:

12.3. for autorotation recovery;

7.2.2. for streamer recovery;

7.2.2. for parachute recovery.

8.12.6.4. Timing And Classification

Timing and classification rules 4.8. 7.4. and 12.5 will be used for this competition.

8.12.6.5. Sub-Classes

Sub-classes for this competition are defined by rule 12.5.

8.14 1 EGG LOFT DURATION

8.14.1.1 Object

To launch and recover a model rocket carrying a fragile payload, whilst recording the highest possible airtime under a parachute.

8.14.1.2 Model

Model design and construction is unrestricted

8.14.1.3 Motor

Maximum motor impulse shall be 10Ns ("C" power), using UK homologated 18mm propellants.

8.14.1.4 Payload

Shall be a fresh chicken's egg which must be provided by contest organisers. Eggs must be marked by the organisers to facilitate identification.

8.14.1.5 Scoring

- (a) The CD will set a maximum flight time (max) before the start of the competition.
- (b) A Model making a max need not be recovered.
- (c) A model not making a max shall be recovered for the egg to be inspected for breakage. The Flight score is to be Zero if the egg is damaged in any way or the model is not recovered.
- (d) Three flights allowed, all to be scored, the highest total scores to rank the flyers.
- (e) If any competitors finish the three rounds in equal first place with identical scores, they will be allowed an additional unlimited fly-off flight to determine the winner.

8.14.1.6 Records

For records purposes, any egg loft competition flight may be timed to the ground or out of sight (OOS) at the request of the competitor.

8.14.2 “LAMPREY” PARACHUTE DURATION

8.14.2.1 Object

to launch and recover a simple model rocket under a parachute of restricted diameter, in order to record the highest airtime. [Rules are based on those employed by MG RAK - Aeroclub der Schweiz]

8.14.2.2 Model

Model design and construction is unrestricted

Overall LengthNot less than 590 mm

Body Diameter.....At Least 33.8 mm for 450 mm of the overall length

Note: This coincides with a commercially available Estes BT-55 tube.

Minimum dry airframe weight (less motor and recovery equipment) 50 grams

8.14.2.3 Motor

Maximum motor impulse shall be

Class 1 2.5Ns ('A' power),

Class 2 5Ns ('B' power)

Motors must be UK homologated propellants, typically Estes.

8.14.2.4 Parachute

Maximum parachute diameter to be 750mm.

8.14.2.5 Scoring

Three flights are allowed, all to be summed and be recorded as the competitor's score – the highest scores to rank the flyers.

There is no maximum flight time (max).

8.14.3 UK SPORT SCALE

8.14.3.1 Object

To fly a model rocket that closely resembles an existing or historical guided missile, rocket vehicle, or space vehicle.

8.14.3.2 General

- (a) If the entry is a scale model of a multistaged vehicle, it may be designed so that one or more of the upper stages are inoperable dummies.
- (b) The competitor must have modelled one particular serial-numbered prototype.
- (c) Data must be supplied to substantiate the model's adherence to scale in shape, colour, and paint pattern.
- (d) Scale models of rockets, missiles or space vehicles that are not fin-stabilised may be fitted with transparent fins.
- (e) Plastic kit conversions are not allowed

8.14.3.3 Motors

Maximum allowable total impulse 160NS.

Maximum engine size allowed 80 NS.

8.14.3.4 Number of Flights

Each entry must make a stable flight, and two (2) opportunities will be available to the competitor for this purpose.

8.14.3.5 Judging and Scoring

- (a) Models will be judged for scale qualities in flight condition minus space model motors, from a minimum distance of one metre.
- (b) The Judges may then closely examine the model to judge it for craftsmanship
- (c) The Judges will award points up to the following maximum scores:
 - Adherence to scale 200
 - Finish, Colour etc. 200
 - Degree of difficulty 100
 - Workmanship 300
 - Degree of difficulty 200
 - Flight Characteristic 300

ANNEX 1

SCALE SPACE MODELS JUDGE'S GUIDE

EVENT: () Scale (Class S7)

..... () Scale Altitude (Class S5)

Name:

FAI Licence Number:

Competitor Number:

National Team:

Prototype Name:

Prototype Serial Number:

DISQUALIFICATIONS

(Applicable FAI Rule Number Shown in Parenthesis)

- ___ Prototype is not a guided missile, rocket, or space vehicle (9.1)
- ___ Entry has no lower stage (multi-stage prototypes only) (9.2)
- ___ No length and/or diameter data supplied for prototype (9.4)
- ___ No photograph of prototype supplied (9.4)
- ___ Entry utilises plastic kit parts not identified as such (9.7)
- ___ Entry not submitted in flight configuration (minus motors and recovery device packing) (9.8)
- ___ Entry does not carry competitor's FAI number (4.4.2)

FAI CATEGORY	SUBCATEGORY	JUDGING CONSIDERATIONS	POINTS
Technical Data	Prototype Drawings	To what degree is external prototype detail substantiated by drawings?	
		How authentic are these drawings compared to prototype manufacturer's drawing?	
		authentic, authorised drawings	(0-8)_____
		authentic cross-section drawing(s)	(0-6)_____
		data which define colour and markings on it.	(0-3)_____
		workshop drawing of scale model - scale 1:1	(0-6)_____
		file containing all necessary data	(0-2)_____
	Prototype Photographs	To what degree are external prototype detail, colour, and marking substantiated by photographs?	
		at least one colour photograph of the whole prototype with clearly visible details.	(0-10)_____
		at least three photographs of details and assemblies	(0-15)_____
		Category Total (50 Max.)	

FAI CATEGORY	SUBCATEGORY	JUDGING CONSIDERATIONS	POINTS
Degree of Difficulty	Configuration	To what degree does the entry depart from the configuration of a "finned cone-topped cylinder.	(0-40)_____
	External Components	Consider the number and complexity of the entry's external components including fins, transitions, interstage adapters, shrouds, strapon booster, launch lugs, antennae, etc. Also consider to what extent the aforementioned components were prefabricated by none other than the entrant.	(0-40)_____
	Detailing	Consider the number of separate details including nuts, bolts, screws, rivets, fasteners, welds, hatches, panels, corrugations, etc. Also consider to what extent the aforementioned details were prefabricated by anyone other than the entrant.	(0-40)_____
	Paint Pattern	Consider the number of colours and complexity of the entry point pattern. Also consider the number and complexity of the entry's markings and to what extent these markings were prefabricated by anyone other than the entrant.	(0-40)_____
	"Flyability"	Consider the difficulty in adapting the entry to make a qualified flight including absence of fins, small fin area, extremes of CP and/or CG, etc.	(0-40)_____
		Category Total (200 Max.)	

FAI

FAI CATEGORY	SUBCATEGORY	JUDGING CONSIDERATIONS	POINTS
Scale Adherence	Body and Nose Cone	Award points based on a % deviation from prototype's scaled dimensions as follows:	
		Less than 1% deviation	= 25 points
		Greater than or equal to 1%, less than 5% deviation	= 20 points
		Greater than or equal to 5%, less than 10% deviation	= 10 points
		10% or greater deviation	= 0 points
		Nose cone length	(0-25)_____
		Body length	(0-25)_____
		Body diameter	(0-25)_____
		Overall length	(0-25)_____
		Selected dimensions	(0-25)_____
	Fins	Award points based on a % deviation from prototype's scaled dimensions as follows:	
		1% or less deviation	= 25 points
		2% - 5% deviation	= 20 points
		6% - 10% deviation	= 10 points
		Greater than 10% deviation	= 0 points
		Fin length	(0-25)_____
		Fin width	(0-25)_____
		Overall fin span	(0-25)_____
		NOTE: If prototype is finless, select one (each) SIGNIFICANT length, width, thickness, and span and award points based on % deviation from prototypes scaled dimensions as above and check here ().	
	Colour and Markings (lettering & insignia)	Comparing the entry to colour photographs, paint samples, or other colour substantiation, to what degree does the entry's colour(s) resemble that prototype's colour?	(0-25)_____
		Comparing the entry to photographs, marking diagrams, or other marking substantiation, to what degree to the entry's markings resemble the prototype's markings?	(0-25)_____
		Category Total (250 Max.)	

FAI CATEGORY	SUBCATEGORY	JUDGING CONSIDERATIONS	POINTS
Workmanship	Construction	Consider the absence of visible glue joints, that edges and demarcations should be precise, that planar surfaces should be flat, etc.	
		Nose cone & transitions	(0-50) _____
		Body	(0-50) _____
		Fins or Stabilising surfaces (including clear plastic)	(0-50) _____
		Details	(0-50) _____
	Finish	Consider that surface textures should duplicate base material of prototype; that paint and other surface coatings should be uniform*, thin, dust-free and of the proper texture; that colour demarcations and markings should be crisp* and precise.	
		Nose cone & Transitions	(0-50) _____
		Body	(0-50) _____
		fins (see NOTE) * unless this would deviate from prototype's finish	(0-50) _____
		Category Total (300 Max.)	
		NOTE: If prototype is finless, add the points awarded for finish on "nose cone transitions" to the points awarded for finish on "body," divide the sum by 2, enter the result as points for "fins" and check here ()	

FAI CATEGORY	SUBCATEGORY	JUDGING CONSIDERATIONS	POINTS
Flight Characteristics	Launch	Was the launch successful? If not, subtract 10 points for each misfire or hang-fire for a maximum of minus 30 points (0 or minus)	_____
		Realism of launch compared to prototype. Was the take-off speed abrupt or was it a smooth lift off from the launch pad?	(0-30)_____
	Flight	Realism of flight. Was it a vertical flight without weather-cocking of launcher tip-off? No rotation unless prototype rotated. Stable straight flight without oscillation?	(0-30)_____
	Special Effects	Did the model exhibit any special effects such as Launching a space probe, separating boosters, radio control devices, ejecting satellites, deploying shield, scale launcher, gliding recovery etc. Special effects can only emulate the actions of the prototype. Maximum of 15 points for each effect.	(0-60)_____
	Staging	Add 30 points for each successful stage separation. No points for a single stage model.	(0-60)_____
	Clusters	Add 5 points for each engine that ignites up to a maximum. No points for single engine models.	(0-30)_____
	Staging and Cluster Misfires	Subtract 15 points for each engine that fails to ignite. (0 or minus)	_____
	RC Gliding Descent	Stabile gliding, realism of gliding descent of the prototype and safe landing without damage.	(0-50)_____
	Recovery	Single stage model (or booster stage) Recovery device deployment (1 parachute – 10 points)	(0-20)_____
		Multi stage model (upper stage(s)) Recovery device deployment (1 parachute – 10 points, 1 streamer – 5 points).	(0-20)_____
		Category Total (300 Max.)	

ANNEX 2

SPACE MODELLING JUDGES AND ORGANISERS' GUIDE

1. PURPOSE and FUNCTION of JUDGES GUIDE:

The purpose of this guide is to provide a uniform understanding, interpretation and application of the FAI Sporting Code for Spacemodelling. This guide describes how Flight Judges will officiate at the World or Continental Space Modelling championships. Judges must acquaint themselves with the FAI Sporting Code, Section 4d - Space Models, General Regulations and Special Rules for Contests, Championships and records.

2. JUDGES TASKS:

Flight Timers/Judges Duties:

- a. Impound, safeguard, and distribute certified contest engines.
- b. Impound, safeguard, and distribute FAI approved payloads.
- c. Maintain stocks of flight cards as needed for the competitors.
- d. Check models and recovery devices for proper identification.
- e. Measure the size of recovery devices, if needed.
- f. Know the maximum time limit for each duration type round.
- g. Determine flights adherence to rules and safety. (safety rulings will also be made by the RSO or his deputies).
- h. Declare disqualifications and note rationale on flight cards.
- i. Time and record duration data onto flight cards.
- j. Ensure completed flight cards are sent for data reduction.
- k. Check-in and out stop watches, binoculars, and clipboards as needed to perform their duties.

Special Judge Duties:

- a. Announces the start and stop of each round/event.
- b. Responsible for the check-in and out of judges' stop watches, binoculars and other tools.
- c. Radio control events require that all transmitters be impounded and kept under control of a steward and be issued to the competitor at flight time then returned. The steward or the judge will also monitor radio frequencies to detect interference and communicate this information to the pilot.

Safety and Rule Compliance Officials:

- a. Will give models and recovery devices a pre-flight safety and rule compliance inspection and mark each part.
- b. Attest to the appropriateness of submitted FAI payloads.

Engine Test Officials:

- a. Will attest to the certification of team submitted engines.

- b. Engines will not exceed Newton Seconds value of class.
- c. Test two engines of each batch.
- d. Any failure of tested engines requires rejection of batch.
- e. Batch is defined as the engines required for one engine class in an event regardless of delay length. Maximum three batches are allowed per an engine class per an event.

Scale Judges:

- a. Will award scale static and flight points in accordance with scale judging guide.
- b. Will be responsible for giving copies of the scale judging forms used to record a competitor's points in Scale (S7) and Scale Altitude (S5) to each competitor in these events, before the end of the contest.

3. GENERAL JUDGING CRITERIA:

Experience shows that often two different sets of eyes, knowing the same rules, and seeing the same occurrence will result in two different opinions on what happened. The following section attempts to anticipate areas where different judgements can occur and provide the definition and interpretations necessary so we can reduce potential ambiguities on the field.

a. Who can disqualify a flight (DQ).

The RSO and his deputies are the only persons who can disqualify a flight in the FAI First Category events (World Air Games, World and Continental Championships and International sporting events approved by CIAM). Time-keepers may be called upon to make decisions on flight adherence to rules and safety in the FAI Second Category events (other international sporting events organised by or under the authorisation of NACs. In the case of Scale competition (Class S7), Scale Judges who judge flights for flying characteristics shall continue to judge even if the RSO declares a DQ, in case any protest is upheld by the FAI Jury and the points given for flight characteristics shall then count.

b. Catastrophic Failure.

A catastrophic failure by nature of the name has to be obvious. You as a judge must know of the failure when it occurs. To look later at what appears to be a normal spent casing after a flight while a competitor argues that the delay was too long, short, or missing offers no proof to the claim of a catastrophic failure.

c. Instability.

Any non-glider model that loops while coasting or thrusting is unstable. Unstable models are unsafe and cannot be qualified. Likewise, a power pod that detaches from an otherwise true-flying model and spins about, disqualifies the flight.

d. Unsafe Recovery.

Crashes and other unsafe recoveries cannot be qualified. What constitutes an unsafe recovery? The rules state it is one that creates a hazard to property or people. For consistency let us ask ourselves if we would like to be under the rocket we are judging when it lands. If the answer is "no" then a disqualification is called for especially during payload flights where no minimum size parachute is required.

e. Engine Ejection.

No engines can be ejected - even if they have attached streamers or parachutes, except for boost gliders. All engines have to descend within an airframe that provides for safe recovery. Exception: Boost glider models may eject pods or engines if they have a streamer or parachute. (See below for minimum sizes)

4. SPECIFIC EVENTS:

a. Rocket Glider and Boost Glider.

These models must ascend in a near vertical/non-shallow manner. Where is the cut off on a shallow ascent? Interpret this as a qualified flight: a glider that ascends under power at an angle or more than 60 degrees from the horizontal.

Glider also may not loop while thrusting. After burnout, during the engine coast and ejection, looping is permitted - as long as the model does not present a safety hazard to people or property.

Rocket Gliders cannot separate into two or more pieces; boost gliders may eject an engine pod. The pod (airframe) must descend by streamer or parachute..

Glider have to have a stable aerodynamic glide recovery. Often opinions will differ on "what is a glide." Here is how to interpret this. The recovery has to be effected by a stable, predictable, aerodynamic glide with air passing over the wings. The model must descend with a nearly horizontal angle of attack. When is the descent not a glide? Imagine a pilot inside a full sized glider exhibiting the same flight characteristics as the model you are judging. Would you be willing to trade places with the pilot? A "no" earns the flight a disqualification. Rationale: No glide is unsafe recovery.

In classes S4, S8 and S10, a flight is declared official if the model maintains a stable aerodynamic glide for at least 60 seconds, or it lands by stable flight.

b. Streamer Duration.

Streamer lengths have to be a 10:1 ratio to widths minimum.

Rules state that a streamer has to be a single piece of flexible material. This shall be interpreted as one uncut, no joints, homogeneous piece, not two or more pieces, joined together to form one length.

Rules state that a streamer must unfurl. This shall be interpreted to completely unfurl so that the 10:1 length/width ratio is exhibited. A small ball of wadded streamer at the end of an almost completely unfurled streamer, then must disqualify the flight.

FAI rules do not prohibit streamers that form loops or bows once fully deployed. If the wind loops a streamer fully deployed the flight must be considered official as long as no ground hazard results.

c. Payload Flights.

See General, par. 3d. Unsafe Recovery.

d. Scale Events.

The scale judges will judge scale models for flight characteristics in accordance with Annex 9 particularly taking care of the following:

d.1. Flight Characteristics-Staging:

Stages must separate step by step. If the 3rd stage separate simultaneously with the 2nd stage the flight will be considered two stage only. With Saturn 1B and

Soyuz if the competitor performs a powered flight of command module, this shall be evaluated as "modeller's third stage" , according to par 2.3.1.

d.2. Flight Characteristics Special Effects:

As Special Effects (according to the judging rules) may only emulate the action of the prototype. Three staged rockets, like Ariane, shall not deploy nose cone cover shield and jettison a satellite during operation of the 1st or 2nd stage. On the contrary, with Saturn or Soyuz function of rescue system during the 1st stage operation is planned and possible. In case of doubt, competitor is obliged to prove reality of declared special effect by relevant technical data. How many points award for several special effects? Compare the degree of difficulty of four booster separation to smoke before lift off!

d.3. Cluster : "Cluster"

should be understood to be a set of more than one engine placed in more than one nozzle of the scale model and which shall ignite simultaneously. They are exact replica of a multi nozzle prototype one nozzle of the prototype – one spacemodelling engine. So if four engines are ignited simultaneously judges shall give points for cluster 4 time 5 point – 20 points. For prototypes with only one nozzle in which some space scale modellers use to put cluster of smaller space models engines points for cluster shall not be awarded (so 4 times 10 Ns engines tied together in one nozzle is zero points for cluster). However, if one of these engines does not ignite – it is "Misfire" that should be punished with minus 15 points. This shall be easy to understand if you compare a degree of difficulty of a set of engines placed in model nozzles like at a prototype - distant from the longitudinal axis of a model in comparison with a several engines tied together in centre of model's body.

d.4 Flight Characteristics-Recovery:

For single stage, one parachute up to 10 points will be awarded. If a single stage rocket separates up to 20 points will be awarded. With multistage models deployment of a parachute will be awarded up to 10 points and a deployment of streamer 5 points. Maximum recovery points in any case may not exceed 40. To prove if the scale models to be launched are the same models which were submitted for static judging, judges will designate each model with an appropriate marking during the static judging.

e. Parachute Duration.

Parachutes must deploy. No minimum sizes are stated. Where then is the cut off of a deployed parachute and one not deployed? FAI rules state that at least three shroud lines make up the parachute. Broadly speaking, to deploy means to widen. The working definition on a "deployed" parachute then will be one which exhibits at least three shroud lines and widens out when ejected.

Thus if a model descends under a crumpled wad or slender stick of parachute material, then this is not deployment. However, if the model descends with the parachute partially open or spread out as a fan, the flight is qualified. This un-blossomed parachute will be timed and considered an official flight. The descent must still be safe. The decision of the RSO or his deputies on matters of safely take priority.

5. ORGANISERS TASKS:

a. Scale Events

The organiser of an international contest shall appoint three scale judges from the nomination list of Space Models FAI Judges. In case of World or Continental

Championships, there will be appointed five FAI judges and one reserve judge of different nationalities, including the Chief Scale Judge. Their names will be submitted to the CIAM or CIAM Bureau for approval. The Chief Scale Judge may not be from the organising NAC. He shall organise work of the judging panel and shall represent it. An extra judge (who may be the reserve judge) shall be appointed as the chief of the dimension measuring team.

The organiser shall also provide an adequate area for relevant number of entries with bright overhead lights and with tables for turn in, static judging and dimension measuring. The static judging area will be equipped with dimension measuring devices and a PC with a qualified operator. Access to the static judging area during static judging will be restricted to all persons except for static judges, dimension measuring team, PC operator, contest director and FAI Jury.

b. Altitude Events

b.1. Tracking by Theodolite

Organiser of an international altitude event must provide altitude measuring devices in compliance with the rule 4.9.1.2. and qualified personnel for altitude measuring. He also must provide radio communications between tracking stations, RSO and the computer centre in the field. Altitude measuring team shall do test tracking on duration and/or scale models on the day preceding the competition day(s) for altitude events to check tracking and data reduction systems. The head of the altitude measuring team shall present test altitude measuring results to the Jury to prove altitude measuring team readiness and necessary accuracy of measurements and get Jury approval, before the official flights begin in an altitude event.

b. 2. Use of Electronic Altimeters:

The organizer must provide a calibration tool for simultaneous calibration of all electronic altimeters in use. This tool shall have reference altitudes of 300 m, 600 m and 1200 m. Devices that meet the technical specifications given in paragraph 4.9.2.1. of these rules may be used in contests. The organizer shall preferably for World and Continental Championships provide electronic altimeters of the same type and from the same manufacturers that can be distributed or sold to the participants after the contest. The organizer, also, shall provide a pound for all altitude devices and a log in which shall be recorded when and to whom the devices are issued and when they are returned. This shall be controlled by two stewards. There shall be two launch site monitors at each launch site and four field monitors in the recovery area that may serve as time-keepers in duration classes. Results shall be read, recorded and then posted on the score board just after model recovery.

c. Range Safety Officer (RSO)

Organiser of an international contest will appoint a person to act as Range Safety Officer (RSO) from the FAI nomination list of judges – specialised in spacemodelling. He may appoint other qualified persons to act as his deputies in accordance to the provisions of the rule 4.3. In case of World or Continental Championships, organiser of the contest shall submit name of RSO to CIAM or CIAM Bureau for approval. RSO may not be from the organising NAC. When there are junior and senior classifications at the same place and at the same time organiser shall appoint two RSOs one for senior and the other for junior classification. They shall be not of the same nationality but shall have one language in common.

ANNEX 3

SPACE MODELS WORLD CUP

1. Classes

The following separate classes are recognised for World Cup Competition: S4A, S6A, S7, S8E/P and S9A.

2. Competitors

All competitors in the specified open international contests are eligible for the World Cup.

3. Contests

Contests included in the World Cup must appear on the FAI Contest Calendar and be run according to the FAI Sporting Code. The contests to be counted for a World Cup in one year are to be nominated at the CIAM Bureau Meeting at the end of the preceding year and are to be indicated on the FAI Contest Calendar.

4. Points Allocation

Points are to be allocated to competitors at each contest according to their placing and results as given in the following formula below:

$$B = K \times \left(\frac{X}{Y} + \frac{\log(A) - \log(N)}{10} \right) \times 100$$

where: B = points awarded to the competitor

X = competitor's score

Y = winner's score

A = number of competitors

N = placing of competitor.

Points are awarded only to competitors completing at least one flight in the contest.

In the event of a tie for any placing, all competitors with that placing receive the number of points appropriate to that placing, rounding up the score to the nearest whole number of points

5. Classification

The World Cup results are determined by considering the total number of points obtained by each competitor in the World Cup events. Each competitor may count the result of all competitions, except that only one competition may be counted from each country in Europe (taking the better score for any European country in which he has scored in two competitions). To determine the total score, up to three events may be counted, selecting each competitor's best results during the year.

No more than two World Cup competitions per country shall be organised unless the particular country extends over three or more time zones, when two competitions per time zone may be organised. The better score per time zone counts.

In the event of a tie the winner will be determined according to the following scheme. The number of events counted will be increased from three, one at a time, until the winner is obtained. If this does not separate the tied competitors then the winner will be determined by considering the points obtained in the best three events multiplied by the number of competitors flying in each event. The winner is the one with the greatest total thus calculated.

6. Awards

The winners earn the title of Winner of the World Cup. Certificates, medals or trophies may be awarded by the Subcommittee as available.

7. Organisation

The Subcommittee shall be responsible for organising the World Cup and may nominate a responsible person or a special subcommittee to administer the event.

ANNEX 4

SPACE MODELS INTERNATIONAL RANKING

1. Definition/Description

This is a continuous classification based on the results of all open and limited international events, as well as continental and world championships and world cup contests. The intent of the classification is to encourage competitors to enjoy versatility of space models by flying more than one, traditional, class and to be awarded for efforts made in whole space models activity during the year.

2. Classes

All classes listed in rule 4.3. as World Championships Events for Space Models are recognised for Space Models International Ranking.

3. Competitors

All competitors in specified international contests are eligible for Space Models International Ranking (SMIR).

4. Contests

Contests appearing on the FAI Contest Calendar, run according to the FAI Sporting Code and nominated at the CIAM Bureau Meeting at the end of the preceding year will be recognised for SMIR.

5. Points Allocation

Points are allocated as follows:

$$B = K \times \left(\frac{X}{Y} + \frac{\log(A) - \log(N)}{10} \right) \times 100$$

Where B = points awarded to the competitor

X = competitors score

Y = winners score

A = number of competitors

N = placing of competitor.

K = ranking factor of a contest where for:

World Championships K = 2

Continental Championships K = 1.5

World Cups K = 1

Open Internationals not World Cup K = 0.75

6. Classification

SMIR results are determined by considering the total number of points (but not fly-off points) obtained by each competitor in events registered in FAI Sporting Calendar according the following ranking algorithm:

- a) Points are awarded only to competitors completing at least one flight in the contest.
- b) Only one competition of the same rank for the same class may be counted from each country in Europe or per time zone for countries extending over three or more time zones (taking the better score for any European country or time zone in which he had scored in two competitions).
- c) To determine the total score up to seven events of at least two different classes will be counted, selecting each competitor's best results during the year.
- d) In the event of tie the winner will be obtained by increasing number of events counted, one at the time, until the winner is obtained.

7. Awards

The winner earns the title World Space Modeller of the Year. Certificates, medals or trophies may be awarded by the Subcommittee if available

8. Organisation

As per World Cup contests.

9. Communication

As per World Cup contests.

10. Classification Supervision

As per World Cup contest.

BRITISH MODEL FLYING ASSOCIATION

SMAE Ltd

Chacksfield House, 31 St Andrews Road, Leicester, LE2 8RE

Telephone - 0116 2440028 Fax - 0116 2440645

E-Mail - admin@bmfa.org Website - <http://www.bmfa.org>