FAI Sporting Code
Section 6

Fédération Aéronautique Internationale

Regulations for the Conduct of International Aerobatic Events

Part 2
Glider Aircraft

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RIGHTS TO FAI INTERNATIONAL SPORTING EVENTS

All international sporting events organised wholly or partly under the rules of the Fédération Aéronautique Internationale (FAI) Sporting Code[1] are termed *FAI International Sporting Events*[2]. Under the FAI Statutes[3], **FAI owns and controls all rights relating to FAI International Sporting Events**. FAI Members[4] shall, within their national territories[5], enforce FAI ownership of FAI International Sporting Events and require them to be registered in the FAI Sporting Calendar[6].

An event organiser who wishes to exploit rights to any commercial activity at such events shall seek prior agreement with FAI. The rights owned by FAI which may, by agreement, be transferred to event organisers include, but are not limited to advertising at or for FAI events, use of the event name or logo for merchandising purposes and use of any sound, image, program and/or data, whether recorded electronically or otherwise or transmitted in real time. This includes specifically all rights to the use of any material, electronic or other, including software, that forms part of any method or system for judging, scoring, performance evaluation or information utilised in any FAI International Sporting Event[7].

Each FAI Air Sport Commission[8] may negotiate agreements, with FAI Members or other entities authorised by the appropriate FAI Member, for the transfer of all or parts of the rights to any FAI International Sporting Event (except World Air Games events[9]) in the discipline[10], for which it is responsible[11] or waive the rights. **Any such agreement or waiver, after approval by the appropriate Air Sport Commission President, shall be signed by FAI Officers**[12].

Any person or legal entity that accepts responsibility for organising an FAI Sporting Event, whether or not by written agreement, in doing so also accepts the proprietary rights of FAI as stated above. Where no transfer of rights has been agreed in writing, FAI shall retain all rights to the event. **Regardless of any agreement or transfer of rights, FAI shall have, free of charge for its own archival and/or promotional use, full access to any sound and/or visual images of any FAI Sporting Event**. The FAI also reserves the right to arrange at its own expense for any and all parts of any event to be recorded, filmed and /or photographed for such use, without payment to the organiser.

1 FAI Statutes, ...Chapter 1, ...para. 1.6
2 FAI Sporting Code, Gen. Section, ...Chapter 3, ...para 3.1.3.
3 FAI Statutes, ...Chapter 1, ...para 1.8.1
4 FAI Statutes, ...Chapter 2, ...para 2.1.1; 2.4.2; 2.5.2 and 2.7.2
5 FAI By-Laws, ...Chapter 1, ...para 1.2.1
6 FAI Statutes, ...Chapter 2, ...para 2.4.2.2.5
7 FAI By-Laws, ...Chapter 1, ...paras 1.2.2 to 1.2.5
8 FAI Statutes, ...Chapter 5, ...paras 5.1.1, 5.2, 5.2.3 and 5..2.3.3
9 FAI Sporting Code, Gen. Section, ...Chapter 3, ...para 3.1.7
10 FAI Sporting Code, Gen. Section, ...Chapter 1, ...paras 1.2. and 1.4
11 FAI Statutes, ...Chapter 5, ...para 5.2.3.3.7
12 FAI Statutes, ...Chapter 6, ...para 6.1.2.1.3

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TABLE OF CONTENTS

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1. GENERAL RULES FOR INTERNATIONAL GLIDER AEROBATIC EVENTS

1.1. Aims of Aerobatic Championships

1.1.1.1. To establish the champions and the winners in the various programmes.

1.1.1.2. To establish the overall champions and the overall winners.

1.1.1.3. To establish the champion teams and team winners.

1.1.1.4. To promote the sporting skill of aerobatic pilots of FAI member aero clubs and arrange competitive contests between aerobatic pilots of FAI member aero clubs, and to allow aerobatic pilots the maximum opportunity to demonstrate within the scope of the general rules their ability in competition with others.

1.1.1.5. To promote and popularise aerobatics and to develop and foster friendly relations between aerobatic pilots of different countries.

1.1.1.6. In pursuance of these aims and in case of dispute over the interpretation and application of these rules, and any other regulations for the conduct of aerobatic championships and competitions, a competitor shall be entitled to the benefit of reasonable doubt.

1.2. General Regulations

1.2.1. Contest Categories

1.2.1.1. World Championships

a) World Championships will be held every year. The duration of World Glider Aerobatic Championships is recommended to be no more than 9 days between opening and closing ceremonies. Opening and closing dates should be selected so as to allow competitors to travel to/from the contest site on weekends.

b) A National Airsports Control (NAC), or other legal entity, which has applied to be host and organiser will be entrusted with the organisation of World Championships pending approval by CIVA.

c) The organisers will provide conditions for entry and participation for any national FAI member aero club on equal rights basis, and will carry out the World Championships on the basis of the decisions and rules of the FAI.

d) Each NAC will be notified by the organiser, not later than 6 months before the beginning of the championships, of any general organisational conditions such as time, place, travel and visa formalities, entry forms, entry deadline, etc.

e) CIVA shall decide at the meeting which precedes a World Championship which FAI language(s) shall be used as the working language(s) both orally and in writing for all purposes for the duration of the championships.

1.2.1.2. Continental Championships

CIVA agreed in 2010 to hold World Glider Aerobatic Championships every year, so there will be no more Continental Glider Aerobatic Championships until further notice. References to Continental Championships have been removed.

1.2.1.3. Other International Competitions

a) Organisers will be a national FAI member aero club.

b) International contests must be made known to the FAI for inclusion in the calendar of international events by October of the year preceding the contest.

c) Any national FAI member aero club may be invited to participate in an international contest.

d) Each participating national FAI member aero club will be notified by the organising aero club not later than 3 months before the beginning of the contest of any general organisational details and of details specifically relevant to the contest.

1.2.2. Aircraft Categories

1.2.2.1. World Glider Aerobatic Championships are open to:

a) Gliders - Unlimited Category “UG”

b) Gliders - Advanced Category “AG”.

1.2.3. Number of Competitors

1.2.3.1. World Glider Aerobatic Championships will be held or recognised as such if there are at least 15 competitors from at least 5 countries.

1.2.4. Team Composition

1.2.4.1. World Championships

a) National Airsports Controls shall notify the organisers of a World Championships, not less than two months before it is due to start, of the number of competing pilots to be entered from their national aero club up to a maximum of eight (8). The organisers shall have the right, without reference to CIVA, to reduce this maximum number of pilots of each nation from 8 to 6 competitors. In this event the organisers shall at once notify NACs accordingly.

b) Solo entries are allowed and will be accepted from NACs unable to send the minimum number of 3 competitors required for the team competition.

c) The team of each NAC may include the following officials: 1 chief delegate, 1 team manager, 1 trainer, 1 doctor, 1 interpreter, and no more than 3 mechanics.

d) Every competitor must be a member of his or her NAC and must be in possession of a valid FAI sporting licence.

e) Every official must be a member of his or her NAC.

f) The admission of observers depends on the facilities available and is subject to agreement with the organiser.

1.2.4.2. Eligibility “AG”

a) Pilots who have flown in an Unlimited World Championship for gliders during the year of an Advanced contest or in the preceding two years, will only be eligible to fly in the Advanced contest if they gained less than 60% of the maximum possible marks across the sequences they flew in the last Unlimited contest.

b) The same applies to pilots who have flown in an Unlimited or Advanced international championship for powered aircraft, during the year of an Advanced glider contest or in the preceding two years.

1.2.4.3. Non-NAC Entries

a) Organisers are also obliged to accept entries from FAI Applicants as described in paragraph 3.2.1 of Sporting Code, General Section.

b) At their discretion, Organisers may accept further entries from pilots not representing their NAC. These entrants will be classified as “Hors Concours (H/C)”. They will pay normal entry fees, subject to the normal entry deadlines for the contest, and be treated as other competitors. In the event of time constraints, they can expect to be shifted in the order of flight or deleted from the flight programmes altogether at the discretion of the International Jury. H/C pilots will not appear in the final results submitted to FAI and will not be ranked or eligible for any awards or medals.

c) The CIVA President will obtain the permission of the H/C pilots’ NACs for his or her participation in the Championships and inform the organisers if the entry can be accepted.

d) H/C pilots shall posess a current FAI Sporting License.
H/C pilots are to be flown first in each flight programme.

1.2.5. Entries

1.2.5.1. The official entry forms must be completed correctly and submitted to the organising aeroclub not later than requested by the organisers.

1.2.5.2. Every NAC must be notified of the address of the organiser for World Championships not later than 6 months prior to the beginning of the event. (See 1.2.1.1 or 1.2.1.3)

1.2.5.3. Entries may be done by NACs only.

1.2.6. Aircraft Documentation

1.2.6.1. All competing aircraft must meet the performance characteristics required for the kind of flight they will be undertaking. A valid aerobatic certificate of airworthiness or equivalent document issued by the competent aviation authority of the participant's country must be produced to the organisers for every contest aircraft.

1.2.6.2. Aircraft will not be admitted to the contest unless the appropriate documentation has been submitted to the organisers.

1.2.7. Air Safety

1.2.7.1. All competitors must observe and adhere to the regulations currently in force in the organiser's country for air safety as well as the special regulations in force at the contest aerodrome. To facilitate this, the organiser must ensure that an English translation of applicable rules, issued by the Aviation or Customs Authorities of the host country, is available in advance in a bulletin or on the competition website.

1.2.7.2. Any violation of the safety regulations in force may at any time render the offender liable to exclusion from the contest. No responsibility will be undertaken by the organisers for any such violation by competitors or others.

1.2.7.3. To enable the pilot to watch over his or her own safety, an accelerometer must be installed in each competing aircraft.

1.2.7.4. The Chief Judge may exclude a pilot who is not flying safely or whose flying might reasonably be judged to be the imminent cause of an unsafe situation.

1.2.7.5. Any competitor required to interrupt a competition flight due to danger of collision with conflicting air traffic or a bird, should be treated in the same manner as if a mechanical defect (paragraph 4.2.6) had taken place.

1.2.8. Insurance

1.2.8.1. The organisers will provide a promoter's liability insurance of an adequate sum against third party risks for the duration of the contest covering functional test flights, training and competition flights, in accordance with the legal requirements of the country in which the championships or competition is held. The organisers must further have insurance for damages to competition gliders, etc., caused by the organiser or his staff.

1.2.8.2. All competitors must produce evidence of adequate third party insurance valid for the duration of the contest and valid in the organiser's country. The organisers should specify in local regulations the amount of insurance cover regarded as adequate.

1.2.9. Competitors and Aircraft

1.2.9.1. All flights carried out by competitors at World Championships must be made solo; this applies to competition flights and training flights.

1.2.9.2. Replacements of competitors at Championships will be left to the discretion of the International Jury, but no such replacement will in any case be permitted less than 12 hours before the commencement of the first competition flight.

1.2.9.3. A contest aircraft may on the recommendation of the technical commission, and with the permission of the International Jury, be replaced at any time by another contest aircraft.

1.3. Classification of Aerobatic Contests

1.3.1. World Championships “UG” and “AG”

At World Championships the following competition flights will be scheduled:

1.3.1.1. Programmes

a) Programme 1: The Known Compulsory Programme
b) Programme 2: The Free Programme
c) Programme 3: The 1st Unknown Compulsory Programme
d) Programme 4: The Free Unknown Programme
e) Programme 5: The 2nd Unknown Compulsory Programme
f) Programme 6: The 3rd Unknown Compulsory Programme

1.3.1.2. Champions and Winners "UG"

Winners of flight programmes will be:

a) **Winner in the Known Compulsory Programme**:
The competitor who gains the highest number of points in Programme 1.

b) **Winner in the Free Programme**:
The competitor who gains the highest number of points in Programme 2.

c) **Winner in the Unknown Programmes**
The competitor who gains the highest aggregate number of points in Programmes 3 through 6.

World Champions “UG”.

Unlimited World Champions will be:

d) **Overall Unlimited World Champion:**
The competitor who gains the highest total number of points in all the Programmes flown.

e) **Unlimited World Champion Team**:
The team which gains the highest total number of points in all Programmes, taking into account the three highest individual scores in that team. Team awards will only be given if there are at least four complete teams.

1.3.1.3. Champions and Winners "AG"

Winners of flight programmes will be:

a) **Winner in the Known Compulsory Programme**:
The competitor who gains the highest number of points in Programme 1.

b) **Winner in the Free Programme**:
The competitor who gains the highest number of points in Programme 2.

c) **Winner in the Unknown Programmes**:
The competitor who gains the highest aggregate number of points in Programmes 3 through 6.

World Champions "AG"

Advanced World Champions will be:

d) **Overall Advanced World Champion**:
The competitor who gains the highest total number of points in all the Programmes flown.

e) **Advanced World Champion Team**:
The team with the highest total number of points in all Programmes, taking into account the three highest individual scores in that team. Team awards will only be given if there are at least four complete teams.

1.3.1.4. Champions and Winners

a) If weather conditions or technical reasons prevent the completion of all the six programmes, at least 3 programmes must be completed for the event to be valid as a World Championship. In this case, the Overall World Champion will be the competitor who gains the highest number of points in the programmes which have been completed, and also the Winner in each programme will be the competitor who gains the highest number of points in those programmes which have been completed.

1.3.1.5. Awards will be given in accordance with para 0.

1.4. Contest Bodies

1.4.1. The International Jury

1.4.1.1. The International Jury is the supreme arbitration body of international aerobatic events and shall be responsible for:

a) Interpreting the general rules, the judging rules and the general regulations of the contests;

b) Supervising the activities of the Chief Judge and the Board of Judges; during judging, members of the International Jury must not remain in the vicinity of the International Judges;

c) Supervising the technical commission;

d) Dealing with protests from competitors;

e) Overseeing the administration of the contest and ensuring that the organisers of international contests meet the requirements as stipulated in the checklist provided to the organisers for such events.

1.4.1.2. Appointment

a) The International Jury at World Championships will be appointed by the FAI Aerobatics Commission (CIVA) and will consist of a chairman and at least 2 members with adequate reserves, who must be members of different national aero clubs. The Chief Judge shall be an advisory member of the International Jury and the Contest Director shall be adviser to it. Detailed duties of the Jury are contained in Section 3.

b) For World Championships, the Jury chairman will be either a Delegate to CIVA or a member of the CIVA Bureau or a qualified person nominated by the CIVA Bureau. The chairman of the International Jury can also be the chairman of the Glider Aerobatics Sub-Committee of CIVA, even if he or she is not a Delegate to CIVA.

1.4.1.3. Three members of the International Jury must be available to hear appeals or protests submitted by competitors.

1.4.1.4. Any decision taken by the International Jury by majority vote is final.

1.4.1.5. When the International Jury is taking a decision which concerns the team or a competitor of the same national aero club as a member of the International Jury that member of the jury shall abstain from voting.

1.4.1.6. The International Jury may temporarily vary any rules approved by the International Aerobatics Commission (CIVA) during a contest under the following circumstances:

a) There is simple majority agreement within the International Jury, with no abstentions, when conducting a vote to introduce a temporary variation to the regulations, and

b) There is two-thirds majority amongst the participating teams' Chief Delegates, with no abstentions, when conducting a vote to introduce a temporary variation to the regulations.

1.4.1.7. In the event that the rules of the Sporting Code are not adhered to at a World Championship, or if the International Jury is not provided with sufficient information to perform their duties in accordance with the rules, the International Jury may stop the contest until matters are remedied.

a) If remedial action is not taken, the International Jury has the power to declare that the requirements of a World Championship have not been fulfilled in accordance with the rules and that the event has only the status of a World Competition. If this latter action is taken, the International Jury shall prepare a full report for submission to the next meeting of CIVA at which their decision shall either be endorsed or reversed.

1.4.2. Board of Judges

1.4.2.1. Details concerning the employment of the Chief Judge and the composition of the Board of Judges and the appointment and disqualification of its members are laid down in Section 2.

1.4.3. Contest Management

1.4.3.1. The Contest Director will be responsible for the regular and orderly performance of the contest. The Contest Director is responsible to the International Jury for the efficient administration of the contest.

1.4.3.2. The contest management will be composed of:

a) The Contest Director,

b) The Flight Director,

c) The Chief Judge,

d) The Chairman of the Technical Commission.

1.4.4. Technical Commission

1.4.4.1. The Technical Commission will be composed of 3 to 5 engineers or mechanics. CIVA compiles a list of capable engineers or mechanics nominated by the national aero clubs; written evidence as to qualification, experience and technical knowledge must be submitted by the national aero clubs. CIVA selects from the list of approved engineers and mechanics the members of the Technical Commission for World Championships; if possible, the selection of the members of the Technical Commission should be guided by the type of competing aircraft operated during the contest.

1.4.4.2. The representative of the organisers will be nominated as the Chairman of the Technical Commission.

1.4.4.3. The Technical Commission is responsible to the International Jury for the inspection of competing aircraft and of aircraft documentation; for certifying compliance with the airworthiness regulations of aircraft after inspection; for a qualified and objective inspection in case of defects of the technical equipment; and for finding the causes of defects which have occurred during the competition flights. The Technical Commission will advise and inform the International Jury on any points of technical importance.

1.5. Protests

1.5.1.1. Protests will be accepted from individual competitors and teams only. They will be dealt with in compliance with the FAI General Section of the Sporting Code, Chapter 5. All protests must be submitted to the President of the International Jury or Contest Director in writing, either directly or through a member of the jury, with a deposit, not later than two hours after the occurrence, decision or publication of results which causes the protest to be made. "Non-working" hours, as defined in local regulations for the specific championships or competitions will not be counted. Every protest must refer to the rule or rules to which it relates. The amount of the deposit shall be stated in the local regulations for the championships or competition. It should not exceed $100.

1.5.1.2. The deposit will be returned if the protest is upheld. The International Jury may request the attendance of the protesting competitor if it considers this desirable. The decision of the International Jury is final.

1.6. Final Regulations

1.6.1. Interpretation

1.6.1.1. International aerobatic events will be carried out in compliance with CIVA Regulations and local regulations of the organisers.

1.6.1.2. Any differences arising during an event will be dealt with by reference to the above rules. For the interpretation of the text at championships, a standard version written in one of the official FAI languages (English, French, Russian, Spanish) shall be taken as the authority. CIVA will select one of the FAI languages as the basis for interpretation.

1.6.2. Competitors' Pledge

1.6.2.1. All competitors undertake, by signing the entry form, to comply with the General Section and Section 6 of the Sporting Code of the FAI and any local regulations made under rule 1.6.3.

1.6.3. Supplementary Rules

1.6.3.1. The organisers will, within the scope of the CIVA Regulations and the approval by CIVA, prepare such local regulations or specialized details as are relevant and necessary for clarification of organisational problems and duly distribute them to all FAI national aero clubs (see 1.2.1.1, 1.2.1.2 and 1.2.7).

1.6.3.2. The technical and organisational preparations of World Championships will be checked by CIVA regarding their compliance with the general rules before the beginning of the event.

a) Not less than 6 months prior to the World Championships, the organisers shall publish in the agreed FAI language(s) and send to national aero clubs which have indicated a preliminary intention to participate:

i) The local regulations containing only local operating procedures and administrative details including details of the aerodrome at which the Championships will be held.

ii) An English translation of applicable rules issued by the Aviation or Customs Authorities of the host country.

1.6.3.3. Organisers must ensure that at the time of the formal opening of the championship all technical preparations are completed and all required personnel are available.

a) Should the organisers wish to request a waiver on any of the applicable rules in this document (FAI Sporting Code Section 6, Part 2) before the opening of the Championships, they shall submit a waiver application to the CIVA Bureau with sufficient notice. The CIVA Bureau will then decide to grant or dismiss the waiver based on the submitted elements. Only an explicit positive answer from the CIVA Bureau will determine a waiver has been granted. In such case any waived rule shall be announced in the Championships Bulletin and sent without delay to the NACs which have indicated an intention to participate.

2. JUDGING RULES FOR WORLD GLIDER AEROBATIC CHAMPIONSHIPS

2.1. Board of Judges

2.1.1.1. Judging during World Glider Aerobatic Championships will be carried out by an International Board of Judges in compliance with the following rules.

2.1.2. Representation on the Board of Judges

2.1.2.1. At World Championships judges will be invited to apply for selection, irrespective of their nationality, based on their previous RI performance data as recorded in the CIVA Judges Performance Database (JPD). New judge applications for those without International RI performance data can be made by NACs or individuals, but must be accompanied by current RI data produced by the FPS scoring system at a National Competition (not necessarily in their own country). These applications must be made by the deadline published by the President of CIVA in the year in which the Championships are to be held. Judges are subsequently selected in accordance with procedures established by CIVA. The selection process includes a ranking of judges by the RIs in the JPD from past Championships and the results from the mandatory judging test. Up to ten judges can be selected. The contest organiser shall provide accommodation, food and local transport to them and their assistants, with no entry fees. A maximum of two judges per NAC may be appointed. Final selection will be ratified by the Bureau of CIVA.

2.1.3. Qualification of Judges

2.1.3.1. All International Judges selected for the Championships must have been approved by the International Aerobatics Commission (CIVA) of FAI and listed in the FAI official document to that effect. A judge may not be deleted from the International Judges list who has valid and acceptable JPD data listed in the previous five years. Should a Judge, who has existing acceptable JPD or who is new applicant, not be supported by their home Aero Club, he/she will be listed in the International Judges List, in an International Section. Their Nationality will be shown in brackets after their name.

2.1.3.2. To be a current FAI judge at FAI aerobatic championships, an FAI International Judge must additionally fulfill the following currency requirements:

a) In the year in which the championship is held or during the previous calendar year, the judge must have judged at a national or international aerobatic championship of the appropriate category (Advanced or Unlimited).

b) Before the final selection process, all judges and assistants must also have satisfactorily completed a study course on the current rules and regulations. This study course will be composed and administered by CIVA.

c) The Chief Judge will insure that the judge is in possession of current regulations with appropriate translation if necessary. The International Jury, in conjunction with the Chief Judge, shall have the authority to disqualify any International Judge from the championship if it determines that the judge is continuously biased or not competent. This decision will be final and cannot be protested or appealed.

2.1.3.3. If any judge(s) are not available and cannot complete their functions and the minimum of 7 judges are not present, the International Jury will use its discretion in filling the available slot.

2.1.3.4. If a substitute International Judge is appointed under 2.1.3.3 above, they shall only take their place on the Board of Judges at the start of the subsequent programme, and the marks of the departed judge for the programme they did not complete will be deleted.

2.1.4. The Chief Judge

2.1.4.1. For World Championships the Chief Judge will be selected and appointed by CIVA; he/she may not be a citizen of the organiser's country (exceptions to this must be accepted by CIVA).

2.1.4.2. In any case, the Chief Judge must be an International Judge listed in the FAI official record and must have previous experience of serving as Chief Judge at an international aerobatic event (or a major national competition) run under FAI rules.

2.1.5. Composition of the Board of Judges

2.1.5.1. At World Championships the International Board of Judges will be composed of:

a) The Chief Judge;

b) A maximum of 10 International Judges and 10 assistants and a minimum of 7 International Judges and 7 assistants for marking the quality of aerobatic manoeuvres, positioning and harmony.
Two Assistants to the Chief Judge to be chosen by the Chief Judge to provide the administrative services described in 7.1.1.2.

c) Positioning judges for operating the electronic tracking system and for recording the violations of the prescribed performance zone, or 2 Boundary Judges for the conventional recording of infringements of the performance zone.

2.1.5.2. All judges who wish to be represented on the Board of Judges must have a qualified assistant, who must also be approved by the Judging Subcommittee and verified by the CIVA Bureau. Any change in assistant will require approval prior to the commencement of a contest or a programme by either the Judging Subcommittee or Contest Jury as appropriate, without such approval the judge will be excluded. Assistant judges are required to take the mandatory CIVA Judging Test.

2.1.5.3. The International Jury may exclude a judge from the Board of Judges after the completion of any programme if that judge’s Ranking Index deteriorates significantly from those established in previous programmes.

2.1.5.4. The positioning judges working at the electronic tracking system may be nominated by the organisers. The positioning judges shall be supervised by members of the International Jury or their delegates. If an electronic tracking system is not operated, the work of the Boundary Judges and their supervision is organised on the same basis.

2.1.6. Timekeepers and Evaluators

2.1.6.1. The Chief Judge and his assistant will record the timing of flights, ideally an evaluator checking paperwork will be appointed.

2.1.7. Position of Judges

2.1.7.1. The judges (under 2.1.5.1.b) will be posted by the Chief Judge at positions appropriate for observing the competitors, the positions of the judges being at least 15 m apart. The distance of the positions of the judges from the end points of the x/y axes will be a minimum of 150 m and a maximum of 250 m.

2.1.8. Role of Judges

2.1.8.1. The International Judges appointed for marking the quality of the manoeuvres will mark the manoeuvres and infringements of the lower and upper height limits in compliance with the judging rules. (See 7.3.1.1)

2.1.9. Judges' Assistants

2.1.9.1. The assistant(s) has (have) the following tasks:

a) Telling the judge prior to the performance the sequence of the figures, details of the various figures, and any other special features.

b) Recording the mark given by the judge for each figure and writing down into the marking sheet any remarks concerning the rating. Any amendment of record must be signed by the judge.

c) Giving general assistance.

2.1.10. Control of Timing

2.1.10.1. Checking the time of super slow rolls will be the duty of the Chief Judge and his assistants.

2.1.10.2. Recording programme interruptions, and giving penalty points for such interruptions or for infringements of the lower and upper height limits, and the infringement of penalty point rule 5.2.6 of Sporting Code concerning wing dipping at the start and end of programmes, will be carried out under the responsibility and control of the Chief Judge.

2.2. Boundary Judging

2.2.1.1. The use of Boundary Judges, or alternatively a CIVA-approved electronic tracking system is mandatory at World Championships.

2.2.2. Boundary Judges

2.2.2.1. When Boundary Judges are used, they shall be placed either side of the judges' position at the upwind and downwind corners of the 50 m buffer zone around the performance zone. Boundary Judges should, if possible, be international. If they are provided by the organiser, they must be supervised by the International Jury.

2.2.2.2. Team members are not allowed to approach the boundary judge positions closer than 20 m and in any case must not communicate with the Boundary Judges.

2.2.2.3. Boundary Judges will be supplied with radio transmitters to enable contact with the Chief Judge’s workstation. Performance zone infringements will be reported in real time and recorded both by the Boundary Judges and at the Chief Judge’s station.

2.2.2.4. Only box outs observed at the Chief Judge’s workstation to be realistic will be taken into account on the Chief Judge’s score sheet submitted to the scoring system. A record of each Boundary Judge’s noted infringements and those verified at the Chief Judge’s workstation will be kept and will be made available to competitors.

2.2.3. Electronic Tracking System

2.2.3.1. If an electronic tracking system is operated, the position of the aircraft will be indicated by the instrument and performance zone boundary infringements (including the 50 m buffer zone according to 5.2.2.1.a)) recorded by an official appointed to this end by the International Jury.

2.3. Electronic Height Measuring

2.3.1.1. Electronic height measuring devices (HMDs) may be used. The electronic height measuring system used, as well as the rules to operate it, must be approved by CIVA.

2.3.1.2. Whenever an HMD is used, it will be the primary reference to verify compliance with height limits and for decisions on penalties or disqualifications due to height infringements.

2.3.1.3. The final decision whether a penalty should be given or not on the basis of outputs from the HMD rests with the Chief Judge.
For detailed information on the various HMD systems and their operation, see section 10.

2.3.1.4. Persons operating and maintaining the HMD system are international officials.
Their status is comparable to the Technical Commission or International Judges.
They are assigned and responsible to the Chief Judge and must not be associated with one of the competing teams. Throughout the competition all the HMD hardware must remain in the custody of the persons designated for this task and must not be accessible to competitors or team officials.

2.4. Judging Administration

2.4.1. Collection of Marking Sheets

2.4.1.1. Immediately after a competitor has completed a competition flight and the judges have finished marking, the marking sheets will be collected for perusal at the Chief Judge's workstation. Once any required actions are taken (conference, penalties added, zeroes checked etc.) the marking sheets will be forwarded to the scanner for entry into the scoring system. The individual judges themselves must sign off any changes to their marking sheets.

2.4.1.2. Once the marking sheets have left the Chief Judge's workstation, they come under the supervision and jurisdiction of the International Jury.

2.4.2. Publication of Results

2.4.2.1. The total results for each competitor in each of the competition flights shall be available to the competitors in the agreed working language(s), prior to the start of the programme subsequent to the next. The current results of each programme will be published on an information board to indicate the placings of the competitors. The final evaluation and placing will be found and announced after checking by the International Jury, not later than the following day.

2.4.3. Public Announcements

2.4.3.1. Prior to the take-off for and during the performance of a programme, details concerning the competitor concerned may be published by any means (radio commentary, etc.).

2.4.4. Protests, Decisions of International Jury, Confidentiality

2.4.4.1. All protests will be dealt with by the International Jury, in cooperation with the Chief Judge if his assistance is required and his duties permit. Decisions taken by the International Jury are final and must not be changed later. The judges are advised to keep activities of the Board of Judges and of the International Jury strictly confidential.

2.4.5. Procedure for the Mark of Zero

2.4.5.1. A mark of zero can be deserved for one of three reasons:

a) The figure flown may have a single, gross error (e.g. a geometrical error of 90 degrees or more, or simply the wrong figure). This is called a 'hard zero' and is marked on a score sheet with the annotation “HZ”. The judge must also state the reason for applying the HZ.

b) The judge perceives that the pilot has failed to meet the relevant technical criteria for a manoeuvre, that cannot be confirmed as factual. This is called a 'perception zero' and is marked on the score sheet with the annotation "PZ". The judge must also state the reason for applying the PZ.

c) The figure may be basically correct but contain a number of smaller errors that cause the grade to fall to zero by accumulation of downgrading points. This is simply a Numerical Zero and is marked on a score sheet by the annotation “0.0”. The judge should summarize the reasons for applying the Numerical Zero.

2.4.5.2. Detailed instruction for the handling of situations where the panel of judges is not unanimous in grades of zero are given in Section 7.2.

2.4.6. Reprimand and Disqualification of Judges

2.4.6.1. The reprimands and/or the disqualification of judges by the International Jury shall be administered in compliance with the appropriate Sporting Code.

2.4.6.2. In case of a disqualification of a judge, the marking which was the reason for the disqualification will not be counted for the programme in question. CIVA will decide upon the further use of the disqualified judge on the recommendation of the International Jury.

2.4.6.3. On the basis of judging data, which have to be available promptly, it is the duty of the International Jury to monitor the performance of the judges.

3. DUTIES OF THE INTERNATIONAL JURY

The activities of the International Jury will be organised systematically by the chairman of the International Jury from the opening of the contest, i.e. from the beginning of training flights. The chairman of the International Jury should allot duties to each of the members of the jury every day. The various duties include:

3.1.1. Meetings

3.1.1.1. Attending the meetings of the International Board of Judges (dealing with familiarisation, evaluation, checking the marking sheets).

3.1.1.2. If required, holding daily evaluation meetings (after the daily contest programme has been completed).

3.1.1.3. Final meeting of the International Jury. Evaluation of the activities of the International Jury and of the development of the contest and a preliminary assessment of the experience gained during the contest.

3.1.2. Supervision

3.1.2.1. Direct supervision of the International Board of Judges, which is primarily conducted by the Chief Judge. This is to include the calculation of the RI for all judges.

3.1.2.2. Supervision of the Boundary Judges and checking the operation of the electronic tracking device, if in use, or the corner sighting devices used by the Boundary Judges.

3.1.2.3. Supervision of the activities of the scoring office.

3.1.2.4. Supervision of the activities of the Technical Commission.

3.1.2.5. Supervision of the activities of the meteorological centre.

3.1.2.6. Checking the publication of contest results; making visits to the pilots' camp to gather or give information.

3.1.2.7. Supervision of briefings and the drawing of secret lots.

3.1.2.8. Checking the availability and accuracy of medals and trophies at the beginning of the competition.

3.1.3. Mediation

3.1.3.1. Discussion of protests, if necessary in cooperation with the Chief Judge, the Flight Director, the Chairman of the Technical Commission, and the Contest Director. Taking down on record the proceedings in meetings or activities where decisions are sought (e.g. a note of comments, resolutions, etc.). The International Jury will publish the results of all protests and decisions. The meetings of the International Jury must not impede the progress of the contest.

3.1.3.2. Explanatory discussions with chief delegates and team managers to explain measures taken by the Jury; interpretation of the FAI Sporting Code and all regulations. This should be done after completion of the daily competition programme or before the beginning of competition flying (i.e. in any case without impeding the progress of the contest).

3.1.3.3. Control of the Unknown Programmes in accordance with Section 4.3.44, including supervision, composition and explanation, as appropriate.

3.1.4. Organiser's Responsibility

3.1.4.1. The organisers of international aerobatic events must provide the necessary material and technical conditions and the required number of staff in order to enable the International Jury to carry out its functions.

4. THE ORGANISATION OF WORLD GLIDER AEROBATIC CHAMPIONSHIPS

4.1. Administrative Arrangements

4.1.1. Entry Fees

4.1.1.1. Every National Airsports Control sending a team or solo pilot or officials to World or Continental Championships must pay an entry fee for each member of the official team, solo competitors and officials (except judges or warm-up pilots) to the organising Aero Club.

4.1.1.2. Entry fees will be fixed by CIVA on agreement with the organisers.

4.1.1.3. The organiser will notify NACs of the date of payment and of the receiving agency.

4.1.1.4. Entry fees will be refunded if the World Glider Aerobatic Championships do not take place.

4.1.2. Accommodation, Food and Medical Services

4.1.2.1. At World Championships the organisers will provide adequate accommodation and food for the duration of the event to all members of official teams, solo competitors, officials and other assistants for whom entry fees have been paid, on the understanding that no extra charges will be imposed for those services. In addition, airfield charges and other fees for installations on the airfield will be covered by the entry fees for the persons concerned.

4.1.2.2. The organisers may also choose to exclude the costs for accommodation and food from the entry fees. In any event, they will give assistance with room reservation and will ensure that adequate food supply will be available at or near the airfield.

4.1.2.3. The organisers will be responsible for adequate medical services being available to all official participants.

4.1.3. Towing Aircraft and Crews

4.1.3.1. The organisers must make available towing aircraft and crews who are duly qualified and trained for this purpose.

4.1.3.2. The availability of at least two towing aircraft in service and one standby aircraft must be guaranteed. The performance of towing aircraft must meet the requirements of take-off sequence as shown under 4.2.3.

4.1.3.3. Towing fees for competition and training flights may be charged additionally.

4.1.4. Technical Services

4.1.4.1. The organiser will provide technical assistance and hangar space for the competing aircraft, if required.

4.1.5. Interpreters

4.1.5.1. Interpreters for the official language(s) of the contest, working together with the International Jury and the Board of Judges, will be provided by the organisers. The official language(s) must be stated in the Local Regulations.

4.1.6. Briefings

4.1.6.1. Prior to beginning of a contest there will be a briefing by the organisers for Chief Delegates or Team Managers, members of the International Jury and the Judges on

flight conditions, the contest programmes and any other problems which might arise over the interpretation of the rules.

4.1.6.2. For familiarisation with and a standardised interpretation of the judging rules, the Chief Judge will hold seminars with the Judges and Team Managers or other Team Representatives and carry out at least one judging test, for which a non-competing pilot shall be available. However, this judging test can also be conducted during the familiarisation flights, in so far as the pilots give their intended flight programmes beforehand to the starter. Throughout the duration of the contest the Chief Judge will hold routine evaluation meetings with the Judges.

4.1.6.3. Prior to beginning of competition flights on each competition day, a briefing will be held for competitors, Officials, Judges, and the International Jury on organisational matters, concerning the competition day, meteorological conditions, etc. The briefing should last no longer than 30 minutes.

4.1.7. Familiarisation Flights

4.1.7.1. Each competitor at World Championships, timely arrival provided (minimum one day), will be given the opportunity to make at least one flight over the marked performance zone for familiarisation with the local conditions. Organisers should offer a minimum of three days for familiarisation flights and plan to hold judges' briefings and practice judging sessions during this period. Familiarisation flights must be completed prior to the formal opening of the championship.

4.1.7.2. Familiarisation flights are subject to the same safety regulations and minimum heights as contest flights, and will be conducted according to a starting list produced by the organiser.

4.1.7.3. For familiarisation flights, Visual Flight Rules (VFR) of the organising country must be observed, but contest weather minima as specified in Section 4.2.2 need not be fulfilled.

4.1.7.4. No further training flights are allowed after the start of the championship. In case of violations there will be penalties or disqualifications (see 4.3.4.11 and 5.2.4). The International Jury may authorise additional familiarisation flights after the opening of the contest for weather or other compelling reasons.

4.1.7.5. If it is necessary for purposes of media coverage, competitors may be authorised to fly a demonstration programme which must be approved by the International Jury, the Chief Judge and a two-thirds majority of the Chief Delegates.

4.1.8. Sequence of Flights (Drawing of Lots)

4.1.8.1. The sequence of flights for all Programmes will be determined by drawings of lots to be arranged by the Contest Director or his assistant in the presence of a representative of the International Jury. Each competitor (or their representative) will draw their own lot. If available, the drawing of lots may be done by a CIVA approved random software under the supervision of the International Jury.

4.1.8.2. The sequence determined by lot may be altered with the approval of the International Jury if special circumstances require (e.g. use of the same glider by different competitors). The first three places must not be altered for the Unknown Compulsory Programmes. After any drawing of lots, the first competing pilot should have an allowance of one hour between drawing of lots and taking off.

4.1.9. Warm-Up Flights

4.1.9.1. The Organisers will ensure that the first two flights of each contest day and each programme will be by non-competing pilots. The Contest Director, with the concurrence of the Chief Judge, may delete the second warm-up flight.

4.2. Operating Regulations

4.2.1. Radiophones

4.2.1.1. The use of technical devices to convey audible information to the pilot is not permitted during International Aerobatic Contests, except for standard air-ground radio sets. Radios will be set to the official safety frequency which is published in the local regulations. The safety frequency is used only to convey urgent competition or flight safety instructions.

4.2.1.2. Once each pilot is airborne he/she is not allowed to enter the Performance Zone before two-way communication is established with the Chief Judge. The Chief Judge will call the competitor on the safety frequency, saying: “Number x, radio check”. If the pilot does not receive this call, after a reasonable time and visually checking that no other aircraft is flying in the Performance Zone, he/she should call the Chief Judge on the safety frequency and state, “Number x, radio check.” The Chief Judge must respond to this call if he hears it. If two-way communication is not established, the pilot must land immediately. The situation will then be treated as in the case of any other technical defect, in accordance with section 4.2.6.

4.2.1.3. The standard phraseology in the event that a break is required for safety reasons will be the Chief Judge saying “Break, break, break” and no other. The pilot must then stop aerobatic manoeuvring immediately and return to upright level flight. After that, the pilot should land as soon as practicable. A pilot who fails to comply with this instruction from the Chief Judge shall be liable to disqualification from that Programme.

4.2.1.4. A competitor receiving any kind of audible information other than instructions from the contest organisation will be liable to disqualification from the contest.

4.2.1.5. Video cameras may be mounted in/on competition aircraft at the discretion of the pilot.

4.2.2. Meteorological Conditions

4.2.2.1. Competition flights will be carried out between sunrise and sunset at the place of the competition. If weather conditions deteriorate within this time, the International Jury, in consultation with the contest management, will decide upon the start and finish of competition flights.

4.2.2.2. The following meteorological conditions are needed:

a) The performance zone must be free of clouds.

b) The flight visibility, determined with reference to ground features from the midpoint of the performance zone at the release height for the competition flight just taking place, must be a minimum of 5 km.

c) The maximum permissible average wind speed in the performance zone should remain inside the limits of the diagram in Section 4.5.1.
If the contest is significantly delayed due to unfavourable weather and there is a serious risk that the minimum number of Programmes (3) may not be completed in

time, the limit for the headwind in the performance zone may be raised to 12 m/s without exceeding a crosswind component of 7 m/s subject to the following provisions:

i) Unanimous decision by the International Jury

ii) Agreement of the Contest Director and the Chief Judge

This decision is to be taken independently for each class (Advanced and Unlimited).

d) The performance zone must be free of precipitation (see also 4.2.2.9.b)).

e) The performance zone must be free of strong turbulence (see 4.2.2.8); this does not apply to occasional thermals.

f) Visual Flight Rules for the organising country, including any special competition rules, have to be observed.

4.2.2.3. The International Jury's decides if the weather conditions exist according to paragraph 4.2.2.2. In the case of doubts about adequate meteorological conditions, or if at least two Team Chiefs inform the International Jury that weather requirements are not met, the following procedures apply:

a) The members of the International Jury should use an aircraft to be made available for this specific purpose and arrange for a weather reconnaissance flight.

b) If competition flights are in progress, in order to establish the actual weather conditions the next pilot of the towing aircraft will get flight orders by the Jury for a weather report containing all of the required data. The towing aircraft will first cross the performance zone at roughly the release altitude. The competitor will be informed by radio about the purpose of this procedure. The glider pilot will not release during this first towing procedure. If the meteorological conditions are sufficient, the glider will be towed a second time through the performance zone. From this moment regulations according to 0 apply. If the towing aircraft pilot considers meteorological conditions not to be sufficient, and if the Jury decides to cancel the current flight, the competitor will be informed via the "Safety Frequency" or according to the “No-Radio Procedure”, and he must release and land without delay, and without performing any aerobatics.

4.2.2.4. The Contest Director provides the competitors, the Chief Judge, the Board of Judges, and the International Jury with hourly information on weather conditions or at shorter intervals if required by meteorological development. This must include average wind speed and wind direction on the ground and in the performance zone at 700 m and 1200 m height along with the Official Wind Direction as determined by the International Jury. In case the maximum height is less than 1200 m, wind speed and direction must be measured at the upper height limit for the current programme. The weather bulletin with current information on wind speed and direction will be published on a board at the flight line. The bulletin must include the time of the measurement as well as the publication time.

The Team Managers are responsible for passing those data on to their teams.

a) Winds aloft must be measured in or near the performance zone using an approved method with sufficient accuracy e.g. balloon ascent, radar or GPS. The procedure for wind measurement by airborne GPS is described in Section 4.5.2.

b) The International Jury shall provide the Official Wind Direction to the Chief Judge and Contest Director before the start of each contest day and any time it is determined that the Official Wind Direction must be changed. The decision with regard to the

Official Wind Direction – always aligned with one of the performance zone axes – must take into account the predominant direction of the actual prevailing wind. Any change of the Official Wind Direction must be published within 30 minutes from the time the change was determined.

c) When light winds prevail (i.e. less than 5 m/s) it shall be at the discretion of the International Jury not to change the Official Wind Direction, even though the wind direction may be more than 45° off the axis, in order to avoid frequent changes during the day.

d) Under stable weather conditions, adequately meeting the above conditions, hourly information is not required. The International Jury will decide upon the necessity of providing this information.

4.2.2.5. The Flight Director, after consultation with the International Jury, will discontinue competition flights if meteorological conditions deteriorate below the minima of paragraph 4.2.2.2. Such decision may be taken:

a) If measured upper winds are out of limits.

b) If the visibility is judged independently by members of the International Jury, the Chief Judge, tow pilots or competitors to be below the minimum.

c) If there are clouds or precipitation in the performance zone.

d) If competitors or tow pilots report excessive turbulence.

4.2.2.6. If one of the weather conditions deteriorates to less than the minimum during a run and if the Jury decides on an interruption of the contest flights, the Flight Director must be informed immediately. If a competitor is being towed, he will be informed via the "Safety Frequency" or according to the "No-Radio-Procedure", whereupon he has to land without delay.

4.2.2.7. If the height of release of 1200 m (over datum) is not available due to clouds in the performance zone, but if there are at least 750 m available, the International Jury may cancel the first and/or the last figures of a compulsory programme and have the shortened programme flown or split the programme. The procedure is as follows:

a) If the cloud base within the performance zone sets to below 1200 m (over datum) and if the Jury decides to cut a compulsory programme or to split a programme, the pilots must be first advised at a briefing.

b) If a programme is cut, marks for the omitted figures will be cancelled for the pilots who have flown under normal weather conditions. If a programme is split, the scores of those competitors who have flown the continuous programme will remain unchanged.

c) If the cloud base rises to 1200 m (over datum) during a split programme, competitors must fly their full programmes without interruption after the Jury has so instructed and if during the tow normal weather conditions prevail in the performance zone (according to the tow pilot's report).

4.2.2.8. The limit for turbulence in the performance zone (see 4.2.2.2) is +2 G (vertical acceleration). The strength of the turbulence will be determined by five consecutive straight penetrations through the performance zone at 200 km/h at different altitudes. The flight must be conducted by a member of the International Jury or a non-competing pilot appointed by the International Jury, as required, at intervals of not less than half an hour. The flight should be made with an aircraft whose wing loading is comparable to

that of the lightest competing aircraft. A common G-meter with limit needles is to be used.

4.2.2.9. Adverse Weather

a) If in the opinion of a competitor the weather conditions do not comply with competition rules, they may not start their competition flight and land. If the competition flight is started, a repetition of the flight or parts of the flight due to insufficient meteorological conditions is not possible, except if rain can be proved as the reason for the breaking off of the flight. For the repetition of the flight in such a case, see 4.2.6.8.

b) When a pilot encounters rain after release from tow, either before or during the execution of the programme, they may break off their flight and land immediately. The competitor must bring evidence, so they must inform the start line by radio or immediately after landing. In the case where rain cannot be confirmed by a tow pilot or contest officials on the ground (member of the International Jury or a member of the Technical Commission) they must show that the aircraft is wet immediately after landing.

4.2.3. Competition Flights

4.2.3.1. The competitors will start in the predetermined sequence. The intervals between releasing will be individually decided by the Board of Judges and will be adapted to the appropriate situation, in order to grant quick continuation. In Compulsory Programmes eight minutes and in Free Programmes ten minutes can be taken as a guide.

4.2.3.2. No flight shall be required to commence within a period of 30 minutes after the Official Wind Direction is determined or subsequently changed.

4.2.3.3. A competitor must begin and end each programme with a distinct rocking of the wing (dipping a wingtip three times with a bank angle of at least 30°) (see 5.2.6). The pilot shall land immediately at the end of a competition flight.

4.2.3.4. There will be, if required, a 30 minute break after every two hours of competition flying for the Board of Judges to have a rest.

4.2.3.5. The organisers of World Championships must establish an efficient radio or telephone communication system between the Contest Officials (Contest Director, President of the International Jury, Chief Judge, Flight Director, Chairman of the Technical Commission and all Boundary Judges) in order to supervise the running of the contest and the contest rules.

4.2.4. Height Limitations

4.2.4.1. The following height limitations have been determined for all contest flights:

a) Upper limit: 1200 m (over datum)

b) Upper limit: 750 m (over datum) in a split programme

c) Lower limit: 200 m (over datum)

d) In level terrain the datum will be taken to be the elevation of the airfield. In uneven terrain the datum will be the highest point found under the performance zone. The elevation will be rounded off to 50 m, for example, a height difference of 25 m above the field will be ignored.

4.2.4.2. Cable Release

a) The cable release height is at the upper height limit. The tow plane must have a barograph. The barograms have to be kept ready for the Jury.

b) The competitors determine their point where they release. The tow plane will tow in the direction of the principal axis at 1200 m (over datum) with constant velocity through the performance zone. The height and direction will be established one km before entering the performance zone. If the competitor does not release at the end of the performance zone, he will be towed a second time in the same direction. They must release at the end of the second passage at the latest. The tow plane will indicate that requirement by rocking its wings.

c) For towing procedures with Height Measuring Devices see section 10.

4.2.4.3. Height Infringements

a) For an infringement of the upper limit of 1200 m (over datum) the competitor will incur a penalty of 70 points if the first figure is started above 1200 m or this limit is exceeded in the course of the first figure. If the upper limit is exceeded during a subsequent figure, there will be no penalty. This rule can only be applied when an HMD is used.

b) For an infringement of the lower limit of 200 m (over datum), the competitor will incur a penalty of 70 points for each figure flown entirely or in part below this limit.

c) For an infringement of the safety height of 100 m (over datum) the competitor will be disqualified for the current programme.

4.2.4.4. If there is no HMD, height aiming device or electronic positioning instrument available, infringement of the heights of 200 m and 100 m respectively (over datum) shall be determined by the Board of Judges on a simple majority.

4.2.4.5. When terrain conditions in the vicinity of the performance zone permit for checking of the lower height limit, aiming devices can be used, similar to the aiming devices for side boundary control. The application of these height aiming devices occurs in the same way from Boundary Judges. Only one device per level is necessary.

4.2.4.6. Height measuring devices (HMDs)

At present there are three systems approved by CIVA: The Huber height measuring device (HHMD), the Meierhofer height measuring device (MHMD) and the Poznan height measuring device (PHMD). For technical characteristics and operating procedures see section 10. The Local Regulations must state which type of HMD will be used

4.2.5. Performance Zone

4.2.5.1. Programmes will be flown with reference to the longitudinal and lateral axes marked on the ground. The performance zone (see Section 4.6) will be a clearly and distinctly marked area of 1000 x 1000 m, the central point of which will be the intersection of the axes. The performance zone must be situated close to the airfield (runway).

4.2.5.2. The longitudinal (main) and the lateral (secondary) axes shall be marked by 7 contrasting marking strips. The size of these markers must be at least 2 x 9 m, with the long side aligned with the direction of the axis. The end of the axis and the 4 corners of the box must be clearly marked. Two arrows will be placed near the central point of the main axis. They indicate the specified direction of the main axis pointing into the Official

Wind. The International Jury will determine any change of the Official Wind Direction as may be necessary and arrange for the shifting of the direction arrows (see 4.2.2.4 b).

4.2.5.3. The colour of the marking strips must be in distinct contrast to the ground and other airfield markings, which should be removed if possible.

4.2.5.4. Marking of positioning will be carried out by the Board of Judges. Additionally, the recording of infringements of the performance zone may be carried out either with an electronic tracking system or by Boundary Judges in accordance with the judging rules. If the electronic instrument becomes inoperable, the International Jury must decide whether Boundary Judges are to record zone infringements. At World Championships the organiser will prepare 4 corners of the performance zone for the use of the Boundary Judges in such a case.

4.2.6. Measures in Case of Mechanical Defects

4.2.6.1. In the event of a competing glider becoming unserviceable before the start of a flight, the International Jury may, on the recommendation of the Technical Commission, permit the competitor to use another glider or the same glider following the removal of the defect. In case of the use of a different glider, the participant may conduct test flights, where the reaction of the glider may be tested. The manoeuvres to be flown are to be discussed with the International Jury beforehand. The International Jury will determine the number of test flights, considering the requirements of flight safety.

4.2.6.2. In the event of a competitor breaking off his competition flight in case of technical damage which is beyond the pilot's control after take-off, he may be allowed to repeat the flight, provided that evidence of the damage can be furnished to the Technical Commission within 2 hours after landing. For finding the damage only, the following persons will be permitted to work on the glider: the competitor and the mechanic named by the competitor, plus the members of the Technical Commission (except the one belonging to the pilot's Aero Club) and the International Jury. When the cause of the damage has been found, the damage will be repaired by the mechanic of the glider and other experts, as recommended by the Technical Commission. As the situation requires, a test flight may be conducted after a repair.

4.2.6.3. Any damage will be counted as such, provided it is a break or deformation found on parts of the glider without any special devices except magnifying glasses

4.2.6.4. The following defects will not be counted:

a) incorrect adjustment,

b) technical trouble caused by dirt if attributed to negligence of the competitor or his team,

c) insufficient or missing safety devices causing a change of settings during the flight,

d) defect caused by pilot exceeding the flight limits of the aircraft,

e) In the cases (a) to (d) the competitor will not be permitted to repeat his flight.

4.2.6.5. The International Jury must, not later than five hours from the landing of the competitor concerned, decide whether or not a repetition flight will be approved. In the case of doubt on the basis of the statement by the Technical Commission, the International Jury shall decide in favour of the competitor.

4.2.6.6. In order to avoid any delay in the progress of the contest, the flight will be repeated at the end of the current programme even if this is prior to the decision of the International Jury. In the case of an illness or of a technical defect, the latest moment a competitor can fly depends on rules 2.4.2 and 5.1.3.3.

4.2.6.7. The sequence of repetition flights is determined by the sequence of interruptions of competition flights.

4.2.6.8. A competitor making a repetition flight must re-fly the entire programme. Judging and scoring will be continued from the figure during which the technical problem occurred in the interrupted programme.

4.2.6.9. In the event that a technical problem arises with an aircraft that prevents the continued participation of a significant fraction of the competitors, the International Jury may, after discussion with the Chief Delegates, declare the contest concluded. The nature of the technical problem must be confirmed by the Technical Commission.

4.2.7. No Radio Procedure

4.2.7.1. The tow plane must be in continuous radio contact with the Chief Judge on the "Safety Frequency" or the competition must be terminated.

4.2.7.2. If the competitor has no operating radio on board or does not confirm instructions from the Chief Judge or the Contest Organisers, the following signals from the aircraft pilot to the glider pilot are applicable:

a) No release in the performance zone during the first towing procedure: Significant rudder motion, at least 0.5 km prior to reaching the performance zone.

b) Release followed by landing without delay and without performing aerobatics: Significant wing rocking at least 0.5 km prior to reaching the performance zone.

4.2.7.3. Should the glider pilot wish to confirm these instructions, he will use the same motions, whereupon the aircraft pilot will answer with the corresponding signal.

4.2.8. In-flight Data Recording

4.2.8.1. To force such projects to be available for glider aerobatic contests in the future and to test such systems, in-flight data recording, electronic positioning instruments, etc. are allowed for use in World Glider Aerobatic Championships, but only by agreement and in cooperation with and under control of the International Jury, and without any official status. They can be allocated for official use, if they are approved by CIVA. Systems, which give special information during the flight to the pilot (audible or visual), are not allowed during competition flights, except if they are approved by CIVA.

4.3. Programmes For World Championships

4.3.1. Sequence of Programmes

4.3.1.1. The Championship consists of the following six programmes:

a) Known Compulsory Programme (Programme 1)

b) Free Programme (Programme 2)

c) Unknown Compulsory 1 (Programme 3)

d) Free Unknown Programme (Programme 4)

e) Unknown Compulsory 2 (Programme 5)

f) Unknown Compulsory 3 (Programme 6)

4.3.1.2. The above sequence of programmes is mandatory. Any changes due to weather or other compelling reasons must be authorised by the International Jury.

4.3.2. Known Compulsory (Programme 1)

4.3.2.1. The Known Compulsory Programme will be composed of figures and combinations of figures in normal and inverted flight performed consecutively and continuously, observing the prescribed sequence of figures.

4.3.2.2. Composition

a) The programme must be such as to enable competitors to fly all figures safely in the glider available to them, provided the glider meets the requirements of full aerobatic certification. It must be guaranteed that the programme can be flown safely within the available height limitations (see 4.2.4).

b) Performance data and flight characteristics of the expected gliders have to be considered.

c) The Aresti Catalogue (Condensed), Glider Version will be the reference source for figures to be flown in all competition rounds. For Advanced contests the restrictions of paragraph 4.3.5 apply to all programmes.

4.3.2.3. Programme 1 of World Championships “UG” and “AG” will be selected by CIVA at least six months prior to the next World Championships and be published accordingly.

4.3.3. Free Programme (Programme 2)

4.3.3.1. Coefficients

a) The Free Programme is selected by competitors according to the Aresti System, Glider Version. For Advanced contests the restrictions of paragraph 4.3.5 also apply to the Free Programme. Catalogue numbers may only be used once, except for horizontal lines (sub-family 1.1.1) and aileron rolls (Family 9.1).

b) The final sum of figure coefficients must not exceed the amount of 230 (“AG” 175) with a maximum of 10 figures. The sum of the normal figure coefficients may be as large as 233 (“AG” 178), but will be reduced to 230 (“AG” 175), starting with the highest value, by removing one point from the highest coefficient figure that has not had a point removed. In Form A the original figure coefficient will be given as well as the reduced value (see also 4.3.6 and 4.3.7).

4.3.3.2. Versatility “UG”

Free Programmes must contain at least one figure each from Family 2 and Families 5 through 9 of the Aresti Catalogue (Condensed), Glider Version, as specified in the following:

a) From Family 2 (turns and rolling turns) at least a rolling turn with one full roll.

b) From Family 9 (rolls and spins) at least:

i) A half aileron roll (Family 9.1)

ii) A hesitation roll of any extent (Families 9.2, 9.4 or 9.8)

iii) A half positive flick roll (Family 9.9)

iv) A half negative flick roll (Family 9.10)

4.3.3.3. Versatility “AG”

Free Programmes must contain at least one figure each from Families 5 through 9 of the Aresti Catalogue (Condensed), Glider Version, as specified in the following:

a) Family 2 (turns and rolling turns): Optionally, a 90° inside rolling turn (Cat.No. 2.1.3.1) may be flown.

b) From Family 9 (rolls and spins) at least:

i) A half aileron roll (Family 9.1)

ii) A hesitation roll of any extent (Families 9.2, 9.4 or 9.8)

4.3.3.4. The beginning of the Free Programme can be in normal or inverted horizontal flight and the competitor is free to start in any direction, but it must be finished in normal horizontal flight.

4.3.3.5. Sequence Submission

a) Not later than at the opening briefing of the contest, each competitor must submit a computer file for the programme in an acceptable format to the Contest Director for verification of compliance with the relevant rules. Hard copies alone or hand drawings will not be accepted. The computer file must contain completed pages for the three Forms described below in a format declared acceptable by the Bureau of CIVA. The competitor is responsible that the software used has been updated to comply with the Aresti System (Condensed) and Section 6, Part 2 regulations as currently amended by CIVA. If any pilot has not submitted their Free Programme by the opening briefing, they will not be allowed to take part in Programme 2.

b) Form "A" will show all symbols, catalogue numbers, coefficients and Super Family numbers.

c) Form "B" will show the continuous sequence of the programme as it would be flown with the wind blowing from right to left, plus a table listing the figure numbers, their catalogue numbers and coefficients.

d) Form "C" will show the continuous sequence of the programme as it would be flown with the wind blowing from left to right.

e) Forms "B" and "C" must show clear symbols for the wind direction.

f) Only normal Aresti symbols, catalogue numbers, coefficients and Super Family numbers shall be entered. Any other writings or notation will be disregarded.

4.3.3.6. Checking

a) It shall be the duty of the organiser’s officials to check the catalogue numbers, coefficients and Super Family numbers on Form A of each competitor against the symbols on Form B and C, taking the reference numbers of the Aresti System (Condensed) as the basic criteria for deciding compliance with the rules of this section.

b) The final responsibility for accuracy and conformance of Forms A, B and C lies with the competitor. Any inaccuracies in the drawing of symbols or in the quoting of coefficients or the discovery of any cases of repetition of catalogue numbers will be referred to the competitor's Team Manager so that the Forms may be corrected and resubmitted. A written record of the Free Programme check showing date, time and name of checker shall be filed with the original Free Programme forms submitted by the competitor.

c) In order to avoid possible alteration and resubmission of Forms during the contest, NACs may submit the competitors' forms to the organisers for checking not earlier than one month prior to the beginning of the contest.

4.3.3.7. Publication and Changes

a) After completion of the examination of the Free Programmes by the Contest Officials, all Free Programmes will be made available to all participants. The organiser will provide hard copies to each competitor for signature and those signed hard copies will be the ones used by the organiser for reproduction in accordance with para 4.3.3.8. Protests can be made up to 6 hours after the Free Programmes have become available.

b) After the beginning of publication of the Free Programmes, changes are only possible in case of an error in a programme. After the end of the protest time no changes are allowed. In case of errors which are found after this moment which are not acceptable (for example sum of coefficients too high) the programme can be changed by the Chief Judge with the agreement of the International Jury.

4.3.3.8. The organisers will be responsible for reproducing a sufficient number of copies of competitors' programmes to meet the contest requirements. One copy of Form B or C for all Free Programmes shall be provided to each Team prior to the start of Programme 2.

4.3.4. Compulsory and Free Unknown Programmes (Programmes 3 through 6)

4.3.4.1. For Programmes 3 through 6 a total of 28 figures will be chosen from Section 9. A representative of every NAC which has a pilot (or pilots) competing (except as *Hors Concours*) may submit one figure. The order in which teams may select figures will be determined by drawing of lots.
If there are more than 28 NACs participating, representatives will be determined by secret drawing of lots to select one figure each. If there are less than 28 NACs, their representatives will first select one figure. Then, lots will be drawn a second, third and fourth time if necessary, in order to determine which teams will choose a second, third and eventually fourth figure, until a total of 28 is reached.

4.3.4.2. Four figures maximum can be chosen in each of Families 2, 5, 6, 9.9, 9.10 and 9.11/12.

a) In Unlimited, the minimum acceptable K for each figure is 15.

b) No figure may be selected with a K higher than 40 ("AG" 35).

c) In the case of teams which select two or more figures, one must be a reversing figure and the sum of coefficients of the figures proposed by a NAC must not exceed:
– 60 ("AG 55) for two figures
– 80 ("AG" 70) for three figures
– 95 ("AG" 85) for four figures

d) The same catalogue number cannot be chosen again except for Family 9 ("AG" Families 5, 6 and 9).

4.3.4.3. Figures shall be selected taking into account the flight characteristics and operating limits of the competing gliders and the safety of all pilots.
If the representative of a team or an individual competitor is able to show within 30 minutes from the completion of figure selection that a selected figure may exceed the operating limits of competing gliders, the International Jury will ask the team which

proposed this figure either to replace or modify it. After this time (30 min.) the figure selection is considered final.

4.3.4.4. The list of figures in Section 9 for Programmes 3 through 6 will be approved by CIVA according to the Aresti System (Condensed) for Gliders. The operating limits of gliders available (full aerobatic certification) must be considered in compiling the list. This list should be re-approved at each CIVA meeting prior to a World Championship, if necessary.

4.3.4.5. Within two working hours from the completion of figure selection, the International Jury will publish the list of figures available for construction of Unknown Compulsory sequences (Programmes 3, 5 and 6).
Seven figures are set aside for Programme 4.

4.3.4.6. The teams may propose sequences for Programmes 3, 5 and 6 using seven (7) figures each from the list of officially approved figures submitted by the NACs. One figure each from Families 2, 5, 6, 9.9 or 9.10 should be included.
A maximum of two (2) additional figures selected from the Aresti System (Condensed) for gliders, as currently amended by CIVA, may be added solely to aid in composition. These additional figures may contain repetitions despite rule 4.3.4.2 d).
The Contest Director will announce the deadline for submitting proposed sequences. Proposals must contain complete pages of all three Forms A, B and C. Computer files must be submitted, using a CIVA-approved software (see 4.3.3.5). In sequence composition, figures may be used starting from one or the other axis. Nevertheless, figures with their entry and exit on the same axis must maintain their construction as submitted, i.e. with the exit flight path in the entry direction or with the direction of flight reversed as originally drawn.
Sequences must have a minimum K of 175 ("AG" 130) and a maximum of 190 ("AG" 145). This may be exceeded by 3 points to facilitate composing the sequences.

4.3.4.7. Unknown Compulsories (Programmes 3, 5 and 6):

a) The International Jury will select one of the submitted sequences for use.

b) The International Jury may alter the selected sequence, if necessary for safety reasons.

c) Chief Delegates or their representatives may object to a sequence within one hour after publication for safety reasons only. In this case, the International Jury will modify the sequence in order to remove the objection without changing the figures selected according to rule 4.3.4.1.
If it is found that the sequence selected cannot be safely flown within the height available, the International Jury may delete one figure, consulting the Chief Delegate of the NAC which proposed this figure.

d) Sequences, after having been approved by the Chief Delegates or their representatives, will be announced to competitors by the International Jury not later than 12 hours before the scheduled start of each programme.

e) Figures which were flown in one of the previous Programmes are removed from the list and must not be used again.

4.3.4.8. The International Jury chooses seven (7) figures for Programme 4 (Free Unknown) from the list of figures selected according to rule 4.3.4.1. These figures will not appear on the list of figures available for construction of Unknown Compulsory sequences. The sum K of the seven figures should be between 170 and 190 ("AG" 130 to 150). Competitors will

be given the list of figures not later than 24 hours before the deadline for submission of the Free Unknown sequences. Each competitor composes their own sequence for Programme 4 from these figures. No more than two (2) linking figures may be added. The K-factor of linking figures will be set at 5K each for two figures or 10K for a single figure.

4.3.4.9. The beginning of a Free Unknown sequence may be in upright or inverted flight and the competitor is free to start in any direction, but the sequence must be finished in upright flight.

4.3.4.10. Not later than 24 hours before the scheduled start of Programme 4, the competitors must submit a computer file containing the three standard CIVA forms for their Programme 4, as described in rule 4.3.3.5. The responsibility for accuracy and conformance of Forms A, B and C lies with the competitor. Any pilot who has not submitted their Programme 4 sequence on time will not be allowed to take part in Programme 4.

4.3.4.11. Training for Unknown Programmes is not allowed. Competitors violating this regulation will be disqualified (see also 5.2.4).

4.3.5. Allowed Figures “AG”

Except for the following restrictions, all the figures from the Aresti Catalogue (Condensed), Glider Version, may be flown.

a) No full negative loops. No high-speed negative part-loops of more than 45° (1/8th loops).

b) No rolling turns, except Catalogue No. 2.1.3.1 in Free Programmes only.

c) No rolls vertically up. No more than 1/4 roll vertically down. No flick rolls, positive or negative. No inverted spins.

4.3.6. Coefficients for the Programmes "UG"

Programmes	1	2	4	3, 5 and 6
Total coefficient of figures	190K	230K (233K)	max. 200K min. 180K	max. 190K min.175K
Positioning	15K	15K	15K	15K
Harmony	10K	20K	20K	10K

4.3.7. Coefficients for the Programmes "AG"

Programmes	1	2	4	3, 5 and 6
Total coefficient of figures	145K	175K (178K)	max. 160K min. 140K	max. 145K min.130K
Positioning	15K	15K	15K	15K
Harmony	10K	20K	20K	10K

4.4. Awards

4.4.1. World Championships "UG" and "AG"

4.4.1.1. The Winners, second and third placings in the various programmes will be awarded Gold, Silver and Bronze medals and Diplomas of the FAI.

4.4.1.2. The Overall World Champion will be awarded the Gold Medal and Diploma of the FAI; the second and third placings will be awarded a Silver and Bronze Medal respectively and Diplomas of the FAI. The fourth through sixth placings will be awarded Diplomas of the FAI.

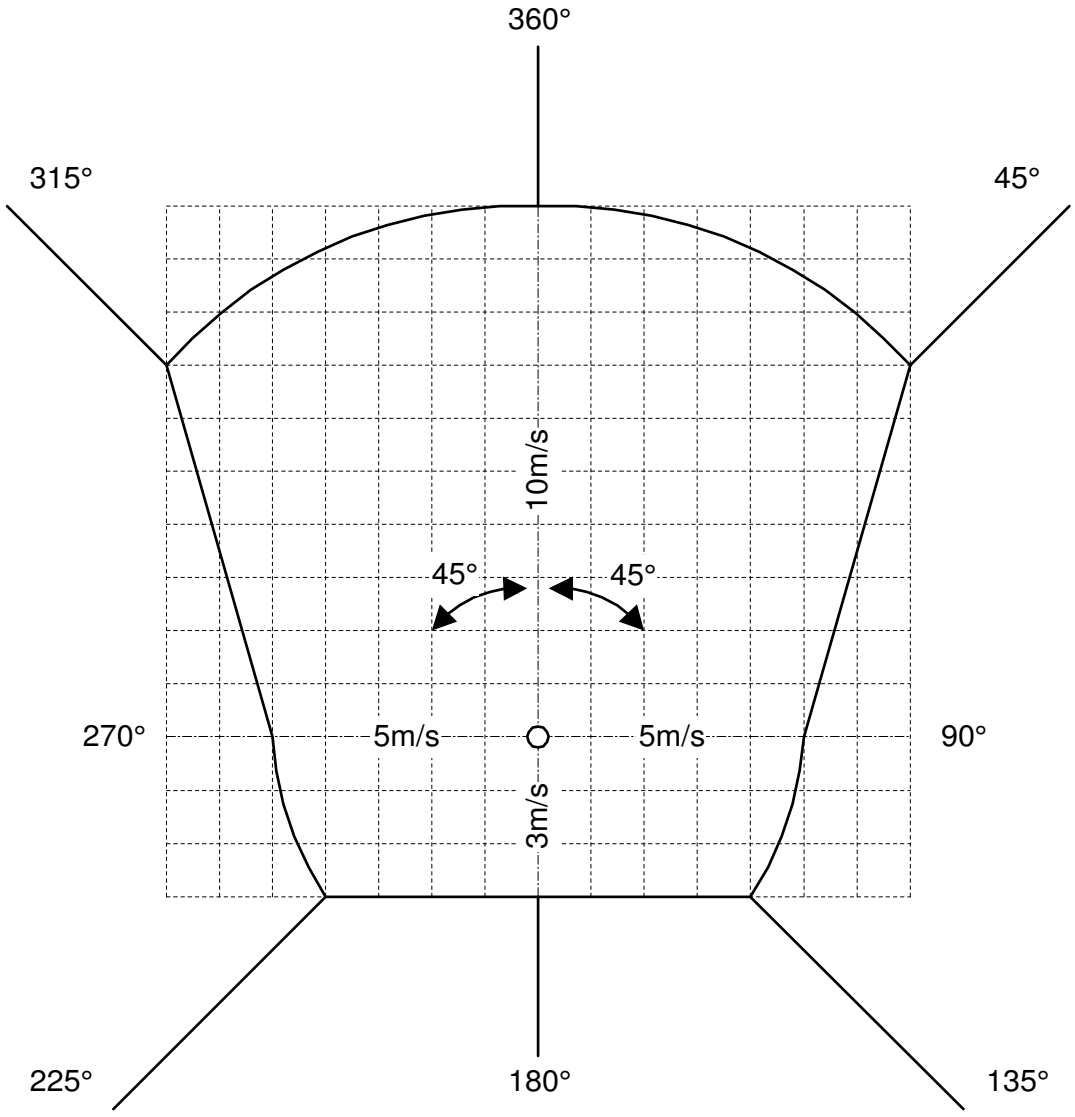
4.4.1.3. The World Team Champions, comprising the three highest-scoring pilots and the Team Manager, will each be awarded the Gold Medal and Diploma of the FAI. The second and third placings will be awarded FAI Silver and Bronze Medals respectively and Diplomas of the FAI. The fourth through sixth placings will be awarded Diplomas of the FAI.

4.4.1.4. The organisers are recommended to award Diplomas to the placings after the sixth place in the overall ranking and from fourth to sixth place in the various programmes.

4.4.1.5. The organisers are recommended to give awards at World Championships to the Chief Judge, the Panel of Judges, the Chief of the Scoring Office and all specialists in the computing room.

4.5. Wind Limits and Measurement

4.5.1. Wind Speed and Direction Limits



4.5.2. Procedure for Measurement of Wind Speed and Direction by Airborne GPS

4.5.2.1. Wind velocity shall be measured at 700 m and 1200 m (over datum) using the procedure described below. If the wind cannot be measured at 1200 m due to clouds, measurement shall be made at the greatest height possible rounded to a multiple of 100 m.

4.5.2.2. Any GPS device either permanently fixed or hand held may be used, provided it is designed for speeds up to at least 150 km/h.

4.5.2.3. Flight Procedure:

a) Choose an airspeed appropriate for the aircraft and the weather conditions. The pilot must be able to maintain a horizontal flight path at this speed.

b) Fly track true north and maintain the chosen airspeed as accurately as possible. Read and record the groundspeed indicated on the GPS device (Vn). Repeat this procedure for true tracks south, west and east. Record the ground speeds Vs, Vw and Ve for those directions. The easiest way to get these data is to fly a rectangle.

c) Repeat this procedure for both required heights.

4.5.2.4. Calculation of wind speed and direction: (V = ground speed measured by GPS, W = wind speed)

a) Determination of the north-south wind component: $Wns = \frac{|Vn - Vs|}{2}$. If Wns = 0 then the wind direction is 090° or 270°.

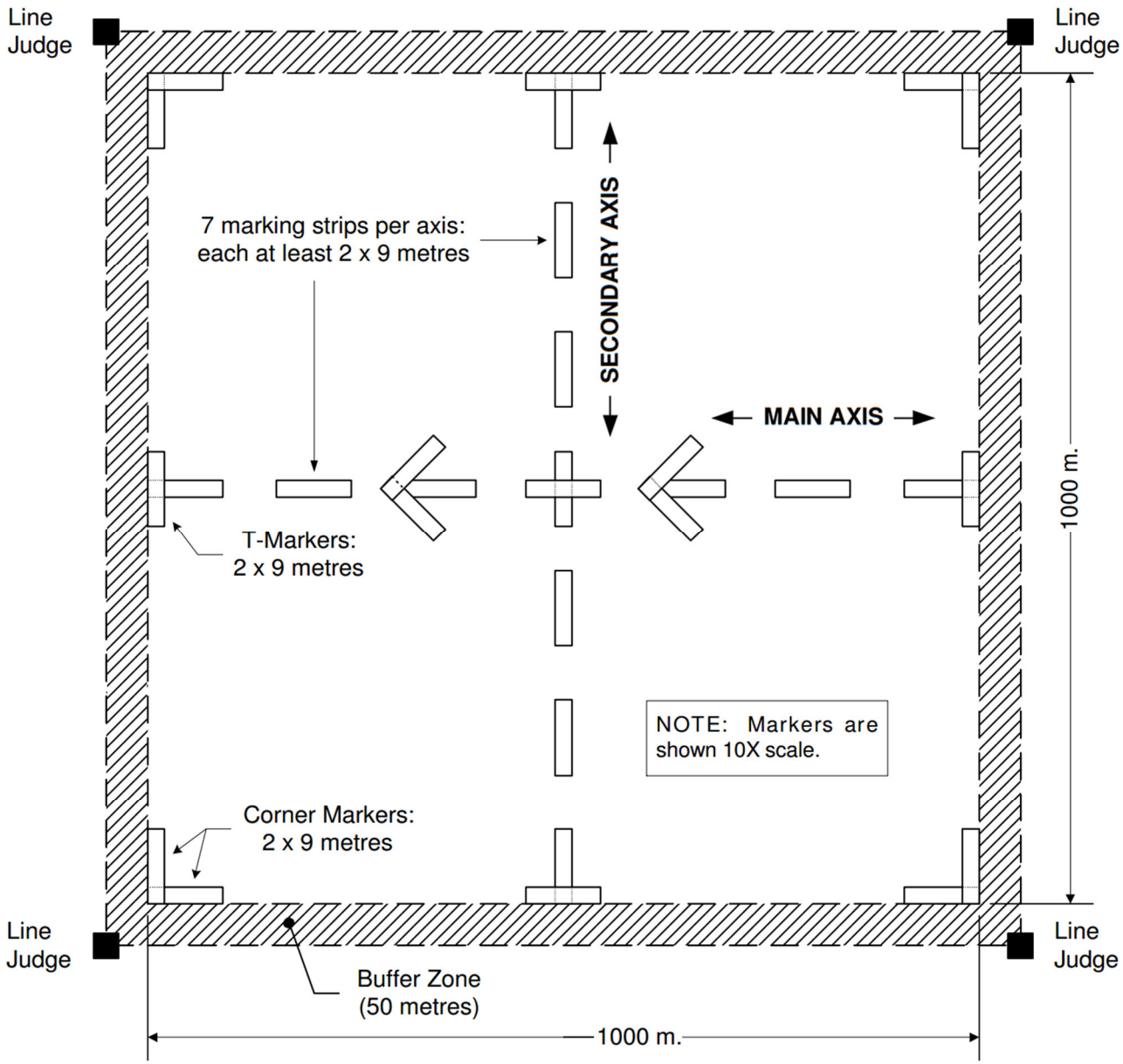
b) Determination of the east-west wind component: $Wew = \frac{|Ve - Vw|}{2}$. If Wew = 0 then the wind direction is 360° or 180°.

c) Total wind speed: $W = \sqrt{W^2 ns + W^2 ew}$

d) Wind Direction: If the wind direction is not one of the cardinal points (from 4a or 4b) the table below should be used.

N/S component	E/W Component	Wind Direction WD
Vs > Vn	**Ve > Vw**	$WD = 270° + \arctan\left[\frac{Vns}{Vew}\right]$
Vs > Vn	**Ve < Vw**	$WD = \arctan\left[\frac{Vew}{Vns}\right]$
Vs < Vn	**Ve > Vw**	$WD = 180° + \arctan\left[\frac{Vew}{Vns}\right]$
Vs < Vn	**Ve < Vw**	$WD = 90° + \arctan\left[\frac{Vns}{Vew}\right]$

4.6. The Aerobatic Performance Zone



5. REGULATIONS FOR THE EVALUATION OF COMPETITION FLIGHTS

5.1. Evaluation of the Performance

5.1.1. Judges

5.1.1.1. Each programme of World Championships will be marked by the Judges using a standardised system (see Section 6 and also 5.2 and 5.3 below).

5.1.1.2. The marks given by a Judge to a pilot of his/her own country shall be included.

5.1.1.3. Where the majority decision of the Panel of Judges is required, in a case of disagreement about the penalisation of the flight of a competitor, the Chief Judge shall have a casting vote in the event of a tie.

5.1.2. Marks for Figures

5.1.2.1. The Judges will independently mark the quality of each figure and its components marking with numbers 0 to 10 in intervals of 0.5, using the point reduction system for each element of a figure as described under paragraph 5.3.1 and Section 6. A Hard Zero (HZ) mark will be awarded if the figure is incorrect or missing, in accordance with paragraph 5.3.3.

5.1.2.2. The scores will be calculated by multiplying the coefficient (K) for each figure by the mark given to each.

5.1.2.3. When marking the quality of the performance of individual figures, the Judges have to consider the following general principles:

a) the geometry of the figures (including shape, radii, angles, plane of flight, direction of flight), which must be in compliance with the prescribed criteria;

b) the precision of the performance, for which there are Marking Criteria set out in Section 6;

c) the distinctly recognizable start and finish of each figure with a horizontal line;

d) the figure flown must be in accordance with the pre-stated figure in the original sequence;

e) that in judging a figure which comprises a combination of manoeuvres, the marking criteria of its various components continue to apply, but the combined manoeuvres are to be taken as a unit;

f) that the length of lines and the size of radii caused by the flying characteristics of an aircraft are not to be taken into account in the marking;

g) that inverted figures are judged by the same criteria as upright figures.

5.1.2.4. Once horizontal flight path is established at the end of a figure in a sequence, the beginning of the next figure is considered to have occurred.

5.1.2.5. If a judge misses seeing a figure, or any part of a figure, such that a grade cannot be given with full confidence, the Judge will give a mark of “Average” or “A” to that figure.

5.1.3. Calculation of Scores

The calculation of scores for a competitor's programme will be as follows:

5.1.3.1. The marks given by a Judge are processed according to Section 8, with the final scores being determined for a programme as a whole. A CIVA-approved software programme must be used.

5.1.3.2. It shall be a duty of the organiser to arrange for the publication of the competition results in accordance with rule 5.1.3.3. The marking sheets must be made available to the competitors, Chief Delegates, Team Managers, and Contest Officials for information and/or checking before the start of the subsequent programme.

5.1.3.3. The raw scores of each pilot, by judge, will be published after that pilot's flight without classification or normalisation of the scores. Penalty points will also be listed. The final scores and classification of the performance of the pilots is to be made after the completion of each programme. These will be available not later than the beginning of the flight programme subsequent to the next.
Example: Programme 1 final scores must be available before the start of Programme 3.

5.1.3.4. A copy of the files generated by the CIVA-approved Computer Scoring System must be available to any official or Team Manager upon request. The media used for that copy will be supplied by the requester and has to be compatible with the computer being used by the Contest Organisers. A complete copy of all the files must be sent to the President of CIVA after the contest is finished.

5.1.4. Marking of Positioning

5.1.4.1. 5.1.4.1 If an electronic, radar or radio-controlled tracking system is operated, the observance of the performance zone and the positions of the individual figures are recorded.

5.1.4.2. Conventional Marking

a) If the conventional marking of positioning is used, the Board of Judges will give position marks according to the total impression of the balanced use of the performance zone. In addition, they watch the infringement of the 200 m and 100 m (over datum) height levels. The Boundary Judges only record infringements of three sides of the performance zone.

b) If aiming devices for horizontal lines are used, the checking of the lower limits of the performance zone is also subject to Boundary Judges.

5.1.4.3. If the conventional method is used, the infringements of the performance zone boundaries (and eventually also the 100 m and 200 m levels) will be observed by two Boundary Judges assisted by aiming devices, located along the side adjacent to the Panel of Judges on upwind and downwind corners.

5.1.4.4. Competitors should try to perform their programmes within the available air space in axial symmetry. It is not required, however, to use up all the available airspace vertically, if the number and altitude requirements of the figures in a particular programme would normally allow completion at an altitude higher than the minimum. The highest marks will be given if the central point of a competition flight is above the intersection of the X/Y axes.

5.1.4.5. Procedures for the Marking of Positioning

a) A column headed "Pos" on the Form A marks sheet shall be used to record by exception the position of figures that are not ideally placed.

b) When dictating the mark for each figure, the judge should, where appropriate, add a comment regarding the placement of the figure if this is considered not to be ideal. The shape and size of the basic figure and the location of any manoeuvres within it should be assessed against the "ideal" placement of the figure in the context of the positional scope of the sequence.

c) The following annotations should be used:

Figure placement	Annotation
Slightly left of the ideal position	**L**
Slightly right of the ideal position	**R**
Slightly too near to the judge	**N**
Slightly too far from the judge	**F**
Considerably left of the ideal position	**LL**
Considerably right of the ideal position	**RR**
Considerably too near to the judge	**NN**
Considerably too far from the judge	**FF**

d) At the end of the sequence the annotations in the "Pos" column shall be used to determine the positioning downgrade. Each single letter counts as 0.5, each double letter as 1.0 points downgrade. For example, the annotations L, LL, N, R, R, FF would add up to a downgrade of 4.0 points.

5.1.5. Harmony

5.1.5.1. A flight is harmonious when the individual figures are clearly separated from one another, follow one another at similar intervals in time and space, and when the exit velocity of one figure agrees with the entrance velocity of the next figure.

a) No subtraction of the harmony mark is given when a long pause in a compulsory programme is unavoidable due to un-harmonic construction.

b) When long gliding pauses are unavoidable because of strong winds, no corresponding reductions will be given to the harmony mark.

5.1.5.2. The harmony of a sequence is disturbed if:

a) There is a long pause between two figures, which is not based on 5.1.5.1a) or b);

b) Direction changes between figures are made;

c) After a mistaken or abandoned figure a direction change of more than 90° is made, unless the correction can be done in a vertical line (e.g. after a failed stall turn);

d) The line between two figures (horizontal, descending, or ascending) is changed in its inclination in order to increase or reduce speed.

5.1.6. Video Recording

5.1.6.1. An official video recording shall be made from the Judges' position of every individual competition flight in a World Championship. The official recording shall be available to the International Jury to assist their decision on any protests. The recording shall not be available to competitors or Team Officials at a World Championship, except in the clarification of a protest in conjunction with the International Jury and with their agreement. The official recording shall also be available to the Chief Judge and the Board of Judges to assist their discussion on matters of fact.

5.1.6.2. These video-recordings (tapes) will be given to the Chief Judge after each programme and will be kept in his personal possession until the end of the contest and will only be made available to the International Jury.

5.1.6.3. After the completion of the championships, the recording may be released by the organisers for use in training.

5.2. The Penalty Point and Devaluation System

5.2.1. Infringements of Height Limits

5.2.1.1. A competitor flying a figure or part of a figure lower than 200 m (over datum) will receive 70 penalty points for this figure. A competitor flying their programme lower than 100 m (over datum) will be disqualified for this flight (see 4.2.4.3).

a) When an HMD is used, a penalty of 70 points is given if the first figure is started above 1200 m or this limit is exceeded in the course of the first figure. If the upper limit is exceeded during a subsequent figure, there will be no penalty. The start of a figure occurs when the aircraft departs from level flight for the first time or when a roll is started on a horizontal line.

b) When an HMD is used, the Judges will mark all the figures regardless of the altitude and also note down any height infringements they observe. The excursions below 200 m will be recorded at the Chief Judge's position and penalty points will be assessed accordingly. 70 penalty points will be given for every figure during or before which the 200 m signal is received and confirmed to be correct.
In case of doubt, the official video should be checked for audible outputs from the HMD equipment in relation to aircraft flight path and/or attitude at the time of the HMD signal in order to determine whether the signal was received before or after the completion of a figure and thus whether a penalty should be given or not.

c) The end of a figure occurs as soon as the aircraft completes the curved portion of the manoeuvre and enters horizontal or gliding flight, or as soon as the aircraft flies through the horizontal line between two figures. In rolls, the end of the rotation along the longitudinal axis is taken to be the end of the figure.

d) In any case, the final decision whether a penalty should be given or not rests with the Chief Judge.
For detailed information on the various HMD systems and their use, see section 10.

5.2.1.2. In the case where the lower height boundary is supervised by using an aiming device, the respective boundary judge will transmit a height infringement to the Chief Judge. If there is a figure flown below the height limit of 200 m at any one position, this figure will be given a penalty of 70 points.

5.2.1.3. In the case where the Judges assess the lower boundary, each Judge will note in writing a height infringement on his score sheet, independent of the other Judges; however, he continues to evaluate the figure being flown.

5.2.1.4. When infringements of the lower height limits are estimated by the judges, they will be penalised only if a simple majority has recognised the violation and duly recorded this on their marking sheets. In case the required simple majority could not rise from a vote within the Board of Judges, the Chief Judge shall have a casting vote.

5.2.2. Infringements of the Performance Zone

5.2.2.1. Excursions

a) Every excursion outside of three boundaries of the performance zone (plus 50 m tolerance) will be separately registered. The time of excursion will be determined by the two Boundary Judges located along the Panel of Judges on upwind and downwind corners. Such excursions will be penalised by 2 penalty points per second.

b) The time of excursion outside the rear boundary will not be registered and penalized but the Judge may deduct 0.5 to 1.0 from the mark for each figure badly visible due to unreasonably long distance from the Judges' position (see 6.10.2 “Optimal Placement of Figures”).

c) In the event of a competitor flying around the outside of a corner, then the total time recorded by the boundary judge at that corner shall be taken as the correct time for this excursion. If the two Boundary Judges measure the duration of an excursion outside their common boundary differently, an average of the two times will be calculated and the penalty points awarded accordingly.

5.2.2.2. All figures of a programme even when they are flown outside of the side boundaries of the performance zone, are given marks; however wide excursions may influence the position mark.

5.2.2.3. Figures flown far outside of the performance zone may be graded Perception Zero (PZ) because of poor visibility.

5.2.3. Programme Interruptions

5.2.3.1. Each programme interruption will be given 70 penalty points. A programme interruption is a direction change of more than 90º that is not designated in the flight programme (exception: manoeuvres covered by 5.2.3.2). These can be:

a) an interruption of a programme in order to return to the performance zone;

b) an intentional programme interruption with arbitrary direction changes (e.g. full circles).

5.2.3.2. If a pilot is compelled to change his direction after a mistake or after an abandoned figure in order to resume the predetermined direction and has already received a Hard Zero mark for that figure, no penalty points for an interruption will be subtracted. This correction of direction or orientation must not be more than a heading change of 180 degrees or attitude change of more than one half roll or loop.

5.2.3.3. The pilot should not rock the glider's wing before or after a programme interruption. Wing rocking indicates the final conclusion of the programme.

5.2.3.4. A programme interruption in order to gain altitude by thermalling will lead to disqualification for that flight programme.

5.2.4. Violation of Training

5.2.4.1. Training for Unknown Programmes will lead to disqualification from the entire contest

5.2.4.2. The pilot will be assigned 200 penalty points for each occurrence of a training manoeuvre which is not part of the current programme.

5.2.5. Failure to Appear

a) In the case of the failure of the participant to appear at the designated take-off time, the pilot can be changed to the end of the current programme in the Known Compulsory and the Free Programmes, however they will receive a warning and 300 penalty points for that flight. If the same pilot fails to appear again, they will not be allowed to start in that programme.

b) In the case of the failure to appear at the designated take-off time for an Unknown Compulsory Programme, the competitor will not be allowed to participate in that flight programme. Exceptions from this rule can be made on a case by case basis only by the International Jury.

c) In urgent cases the participant may report late to the starter, but the variation from the stated rules can only be determined by the International Jury.

5.2.6. No Wing Dip at the Beginning or End of a Programme

5.2.6.1. The pilot will be given 35 penalty points for failure to do a wing dip at either the beginning or ending of a programme (or doing it so little that it is not apparent to the grading judges).

5.2.6.2. The Boundary Judges stop considering boundary infringements at the first wing dip marking the end of the flight programme or, in case that it is not seen, 10 seconds after the aircraft leaves the performance zone after the end of the last figure.

5.2.7. Violation of Flight Regulations and Dangerous Flying

5.2.7.1. Competitors found guilty of violating flight regulations and/or causing a dangerous situation will, on the recommendation of the International Jury, be disqualified by the Contest Director. The Chief Judge may, with the agreement of two-thirds of the Board of Judges, exclude a pilot who is not flying safely or could cause an unsafe situation. This would apply from take-off to touchdown. (see rule 1.2.7.4)

5.3. Rules for the Marking of Figures

It is assumed by a Judge that a contestant is going to fly a perfect figure, therefore he/she starts with the grade of 10 and proceeds to downgrade this mark by fixed values as prescribed herein and by further values in conformity with the Judging Criteria in Section 6.

5.3.1. Downgrades

5.3.1.1. For deviations from the correct geometry (plane of flight, direction of flight, angle of bank) and for deviations from the proper flight path or the proper attitude (as appropriate), the mark will be reduced by 1 point per 5 degrees of deviation.

5.3.1.2. The absence of a distinct horizontal start and/or finish to a figure will reduce the mark by 1 point in each case for each figure affected.

5.3.1.3. Horizontal lines will be judged on flight path, not the attitude of the glider (see 6.3.1 and 6.8.1.3). Horizontal lines in glider aerobatics may be inclined between zero (0) and ten (10) degrees below the horizon.

5.3.1.4. The reference for vertical and 45 degree lines is the angle of the zero-lift axis (see 6.3.2) relative to the true horizon. On vertical and 45 degree lines, the flight path is subject to wind influence and must be ignored when judging these lines.

5.3.1.5. If while in the pre-stated flight plane (vertical, horizontal, 45 degree inclination) a competitor allows his glider to bank around the longitudinal axis, the mark will be reduced by one point for every 5 degrees of difference between the actual and the prescribed plane of flight.

5.3.1.6. If within a figure two or more lines have to be of the same length, the basis for judging is the first line flown. Any observed variation must be penalised by reducing the marks in accordance with paragraphs 6.8.1.12 and 6.8.1.13.

5.3.1.7. Over-rotating a roll and rolling the wings back again must be penalised by 1 point per 5 degrees of over-rotation, even if the correct geometry is resumed afterwards, no matter how quickly the correction is made. The same provisions apply when, at the end of a

loop or part-loop, the aircraft is pitched beyond the desired line and then brought back again.

5.3.1.8. Rolls flown in combination with a turn (family 2) or loop (families 7.4, 8.6 and 8.7) must be smoothly continuous; i.e. there must not be any change in the rate of roll from beginning to end. Specific downgrades for rolling turns are noted in paragraph 6.9.3.7.

5.3.1.9. If the total of downgrades in this section leads to a value lower than the score of 0.5, a valid mark of 0.0 will be given to the figure.

5.3.2. Perception Zero

5.3.2.1. A grade of "perception zero" (PZ) should be given if the Judge considers that the figure is incorrectly flown in respect of a criterion that is a matter of subjective perception, rather than clearly demonstrable fact. For example, if the Judge considers that a flick roll or spin never started proper auto-rotation, that a tail slide did not move backwards by the required amount or that a rolling turn included a flick roll.

5.3.2.2. The Chief Judge should check that PZ's are applied only to manoeuvres where a perception error has been seen, and that a plausible reason has been given. The CJ has no other input regarding the presence of PZ's; they are subjective decisions made by individual judges and there is no requirement to review or "Confirm" them.

5.3.3. Hard Zero

5.3.3.1. A grade of "Hard Zero" (HZ) should be given if the judge considers that the figure is incorrectly flown in respect of a geometrical error, as listed below, that is clearly verifiable as a matter of fact. A grade of "HZ" will be given to a figure if:

a) Any figure is flown which does not conform to the drawing held by the judges for marking purposes (Forms B or C).

b) When rolls are superimposed on a turn or loop (Rule 5.3.1.8), the roll is finished but 90º or more of the turn or loop still remains to be flown, or the turn or loop is finished but 90°or more of the roll remains to be flown.

c) Any deviation from the prescribed direction reaches 90 degrees.

d) Any other single deviation in geometry/flight path/attitude/rotation reaches 90°.

e) The pre-stated figure or any part of it is omitted.

f) In performing a super slow roll, a half roll is shorter than 4.5 seconds, a complete roll is shorter than 9 seconds, or a one-and-a-half- roll is shorter than 13.5 seconds.

g) Any part of the figure was not visible as it was flown in or behind cloud. If the figure was visible to a majority of judges, then the Chief Judge should instruct unsighted judges to revise their mark from "HZ" to "A".

After a directional deviation of 90 degrees or more on the Y Axis, although it is non-directional, the original direction must be re-established before the next figure is flown. If figures subsequent to a Hard Zero grade are correct and are flown in the correct direction, they shall be marked in the normal way.

5.3.3.2. During a repetition flight (paragraph 4.2.6.8) the figures before the break must all be flown correctly. If a competitor omits or flies such a figure incorrectly, so as to gain an unfair advantage, the grade awarded for that figure during the first flight will be reduced to a Hard Zero.

5.3.3.3. When all Form “A”s have been submitted to the Chief Judge for a flight and difficulties occur in interpreting the correct application of the "HZ" mark:

a) the Chief Judge shall call for a discussion on the judging line by the International Judges.

b) Such discussions shall not interfere with the subsequent flights.

c) The official video may be used in these discussions to help determine matters of fact, but not of perception.

d) A Judge may request a viewing of the video during a discussion, if he deems it necessary. This request will always be honoured.

e) All Form “A”s shall be retained by the Chief Judge until the final decision is made.

5.3.4. Mix of Zeros

5.3.4.1. The Fair Play System computer software programme will handle a mix of Hard Zeros, Perception Zeros or “A” grades in accordance with paragraph 5.3.4.4. In order for this to function correctly, the Chief Judge, if necessary after a conference as described in paragraph 5.3.3.3, must fill the Confirmed Hard Zero (CHZ) field on the judging sheets if a Hard Zero was in fact flown. If review shows the figure to have been correct, the “CHZ” box must be left open.

5.3.4.2. If during this process the Chief Judge establishes that there is a mix of Hard and Numerical Zeros for the same error, i.e. it is only the extent of the error above 45 degrees that cannot be established, and these combined Zeros are in the majority for this error, the Chief Judge shall instruct those judges with the Numerical Zeros to change their score sheets to Hard Zeros and sign the sheets accordingly. The Chief Judge will then fill the CHZ field. Consequently, no judge will in this instance have a point added to his Hard Zero Anomaly count.

5.3.4.3. Should a judge consider a figure started behind the judges, the judge shall grade the figure regardless, but add the comment, “Behind” in the Remarks section of the Form A. At the end of each flight, the Chief Judge shall determine by a simple majority (with the Chief Judge casting a vote as required), if the figure in question was started behind the judges. If the majority holds that the figure was started behind the judges, the Chief Judge shall change all judges’ marks to ‘HZ’. If the figure is deemed by the majority to have been flown in front of the Judges, the original marks shall be handled as with any other figure.

5.3.4.4. When a mix of hard and perception zeroes, non-zero marks and/or “A” grades exists, the following resolution will take place in the computer scoring programme:

a) “A” grades will first be set to “Missing”.

b) If the “CHZ” box has been filled, then all other marks will be changed to “HZ”.

c) If the “CHZ” box is open then “HZ” grades and any "PZ" grades shown to be anomalous will be set to “Missing”.

d) After normalisation, the “Missing” grades will be replaced with Fitted Values determined by the computer.

6. CRITERIA FOR JUDGING GLIDER AEROBATIC FIGURES

6.1. Preface

6.1.1.1. The final mark awarded to a figure has many components, but first and most important in any mark is the geometry of the figure as compared to the true horizon and Aerobatic Box axes. Geometry is derived from two distinctly different entities: flight path and attitude.

6.1.1.2. Basic judging principles are the same in power and glider aerobatics; nevertheless, there are also some important differences. Compared to aerobatic airplanes, gliders have more restrictive operating limits in terms of speed as well as load factors. Most gliders have comparatively slow roll rates in aileron rolls as well as flicks. As most gliders have un-symmetrical wing sections, flight characteristics upright and inverted may differ considerably. All these factors lead to limitations in glider aerobatics, which should be considered, if glider figures and sequences are to be graded fairly.

6.1.1.3. Another important factor which makes glider aerobatics different from power aerobatics is the concept of harmony. The "power" available to a glider is its height at the start of a sequence (potential energy). The pilot must trade height for speed (kinetic energy) to fly aerobatic manoeuvres. Thus, harmony means to manage the available energy most efficiently. The goal should be to come out of each figure with the correct speed to enter the following figure and still fly the figures distinctly separated from each other. It is one of the most difficult – and least understood – tasks of glider judges to mark the harmony of a glider sequence rationally and not to give a mark "out of the belly".

6.2. Definitions

The following expressions are used consistently throughout the text in a very precise sense according to these definitions:

6.2.1. Angle of Attack

6.2.1.1. The angle at which the wings of an aircraft meet the relative airflow.

6.2.2. Angle of Incidence

6.2.2.1. The angle at which the wing is attached to the aircraft.

6.2.3. Figure

6.2.3.1. Each individual component of a sequence, which may comprise one or more manoeuvres in combination; it starts and ends with a horizontal line.

6.2.4. Manoeuvre

6.2.4.1. Any one of the basic aerobatic movements, which may be combined to make a figure (e.g., an avalanche is one figure consisting of two manoeuvres – loop and flick roll).

6.2.5. Mark/Point/Score

6.2.5.1. Marks (from 0 to 10) are assigned by judges, and may be devalued by various point values. The score is calculated by multiplying the judges' marks by the coefficients (K factors) and adding the products.

6.2.6. Plane of Flight

6.2.6.1. There are three planes of flight in aerobatic competition relative to the true horizon: horizontal, vertical and 45 degrees.

6.3. Flight Path and Attitude

6.3.1. Flight Path

6.3.1.1. Think of the aircraft condensed into a single dot and watch the path this dot takes through the sky. This is the flight path, or track, of the aircraft's centre of gravity. Judging the flight path consists of comparing the observed path with fixed references such as the horizon or the X and Y axes of the Aerobatic Box. (Figure 1)

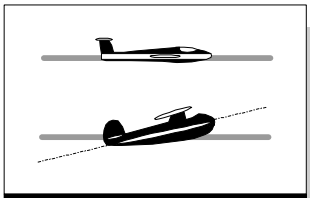


Figure 1

6.3.2. Vertical Attitude

6.3.2.1. Judging vertical lines is based on the attitude of the aircraft and not its flight path. When an aircraft's flight path, in a zero wind condition, is exactly 90 degrees to the horizon, the wings are being held at the correct angle to produce no lift. The aircraft's attitude while in this condition (zero lift) defines the proper judging criterion for vertical attitude. This is called the zero-lift axis.

a) When this zero-lift axis is vertical, the longitudinal axis of some aircraft may not appear to be vertical. (Figure2) This is especially true for most gliders; where, because the wing is attached at an angle of incidence of several degrees, and the airfoil is not symmetrical, a negative angle of attack is required to produce zero lift. The Judge must determine the proper vertical attitude for each aircraft type according to its zero-lift axis. The best opportunity to make this determination is to observe practice flights and note the different vertical attitudes, both up and down, of various glider types.

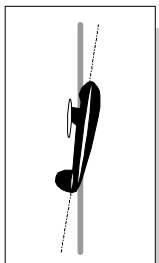


Figure 2

b) An aid for judging the perfect vertical (zero-lift) attitude is to observe vertical rolls. During a truly vertical roll, the aircraft's wings will constantly be parallel to the horizon, something which is especially noticeable after 90 degrees of roll.

c) Be aware that aircraft types whose zero-lift axis does not pass through the tail will make a spiral with the tail during a perfect vertical roll. From the Judges' perspective, this spiral will look as if the tail is shifting off-axis from the zero-lift axis flight path.

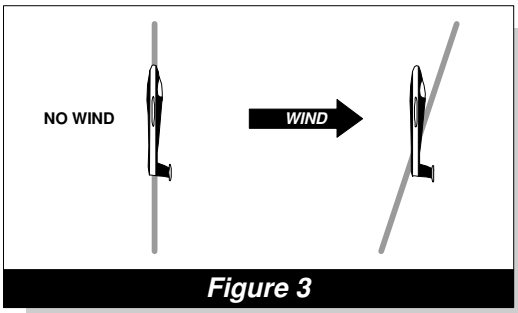


Figure 3

d) When there is a wind of any kind, the observed flight path will be offset from perpendicular to the horizon by some degree. This wind effect must be completely ignored by the Judge, who must only evaluate the accuracy of the vertical attitude. (Figure 3)

6.3.3. The 45 Degree Attitude

6.3.3.1. This is the vertical attitude plus or minus 45 degrees. In view of the difficulty in judging 45 degree lines accurately, scoring deductions should be applied with care. When flown into the wind, a perfect 45 degree line will appear to be steep while the opposite is true when flown downwind. (Figure 4) As with the vertical attitude, this wind effect must be completely ignored by the Judge who must only evaluate the accuracy of the 45 degree attitude.

6.3.3.2. Gliders gain airspeed on 45 degree down lines and lose airspeed on 45 degree up lines. When the pilot keeps the zero-lift axis at the prescribed 45 degree angle to the horizon, the flight path becomes flatter on the up line as lift decreases with airspeed as well as on the down line when lift is increased with increasing airspeed. These changes in the flight path angle must also be ignored when judging 45 degree lines. The prescribed deduction is one (1) point per five (5) degrees of deviation from the correct geometry (0.5 points per 2.5 degrees).

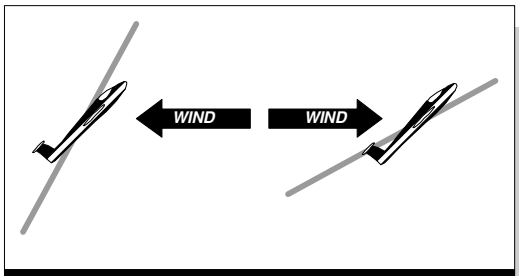


Figure 4

6.4. Marking

6.4.1.1. It should be assumed that a competitor is going to fly a perfect figure, so a Judge starts with a mark of 10. As the figure is performed, the Judge then begins to find faults (if any) with what he or she sees, and starts downgrading as the figure progresses. This system of marking is required by the rules as opposed to waiting until the figure is finished and assigning a mark based on overall impression. The latter causes the judging to be erratic and inconsistent.

6.4.1.2. Should a competitor fly a figure at a location, inside or outside the performance zone, such that the accuracy of the flight path or attitude cannot reasonably be determined, a downgrade of 2 points should be applied for each element of the figure that cannot be properly assessed.

6.5. Summary

6.5.1.1. Remember, it is the Judge's job to find fault: be a nit-picker. On the other hand, give a mark of 10 if you see a perfect figure – but if you are really being critical you won't see too many. Don't get in a rut. Guard against confining your marks in too narrow a range. If you watch carefully and mark consistently, you will find yourself giving an occasional 2, 3, or 4 on some sloppy figures that are not quite bad enough for a zero. You will also be giving an occasional 9 or 10 for the superlative figure with which you can find little or no fault. Take care not to mark on an overall impression of a flight. Be ready to award a low mark for a poor figure even if you have been marking other figures flown by that competitor with 8's and 9's.

6.5.1.2. On the other hand, when you see a competitor barely getting through the figures and you have been giving 4's and 5's, don't be afraid to award a 9 for the almost perfect 90 degree turn that you just saw.

6.5.1.3. Finally, and most importantly, only mark what you see. If you can't see anything wrong with a figure, don't deduct any points, even if you think there must be something wrong. Always give the competitor the benefit of the doubt.

6.6. Box Axes

6.6.1.1. The entry and exit of every aerobatic figure must be exactly aligned with either the X- or Y-axis of the Aerobatic Box. Any angular deviations visible to the judge must be downgraded by one point per five degrees.

a) The X-axis (or main axis) is parallel to the official wind. Any figure with entry and/or exit lines aligned on the X-axis must be flown with such entry and/or exit lines as drawn on sequence Forms B or C, into or away from the official wind, otherwise the figure will be marked HZ.

b) Except for figures from Families 2, 5 and 6: Any line segment within a figure, either straight or looping, drawn on the X-axis, must be flown in the direction drawn on sequence Forms B or C into or away from the official wind, otherwise the figure will be marked HZ.

6.6.1.2. The Y-axis or secondary axis is non-directional i.e. the pilot is free to choose direction when transiting from the X- to the Y-axis.

6.6.1.3. Any figure with both entry and exit lines aligned on the Y-axis must be drawn with parallel entry and exit lines.

6.6.1.4. Any figure with both entry and exit lines aligned on the Y-axis must be flown with the exit direction relative to the entry direction as drawn on sequence Forms B or C, i.e. in the same or the opposite direction, otherwise the figure will be marked HZ

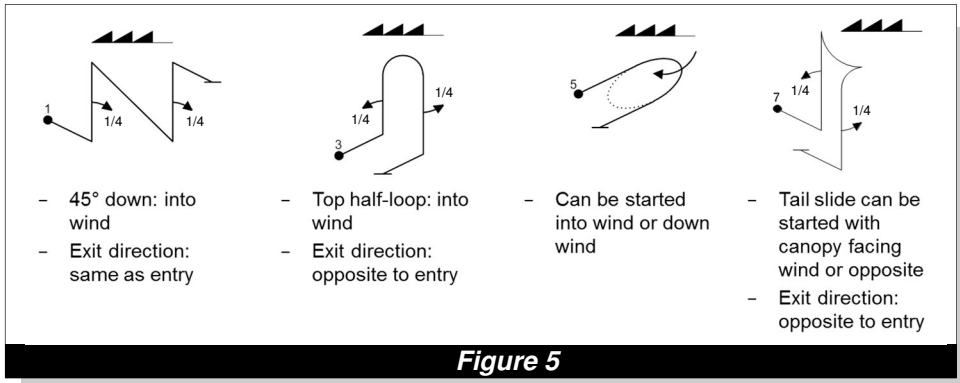


Figure 5

6.7. Wind Correction

6.7.1.1. There are two kinds of wind correction: correction for figure geometry (shape) and correction for Aerobatic Box positioning.

6.7.1.2. The competitor is required to make the shape of all loops and part-loops within a figure perfectly round as seen by the judge on the ground. Wind correction is required for loops and part-loops within figures so that the aircraft's flight path describes a constant radius circle or part circle. Remember, the Judge marks for the roundness of the flight path. Any deviation from perfect roundness must result in a reduction of the mark for that figure.

6.7.1.3. The competitor is also required to keep the aircraft within the Aerobatic Box. This becomes more of a problem when a wind is blowing at an angle to the X axis. (Figure 6) The primary method of dealing with cross-box drift is to include a "wind corrector" figure in the sequence. A wind corrector is a figure which places the aircraft onto the Y axis. Because the Y axis is non-directional, the competitor can turn onto the Y axis in the direction which will allow an upwind position change before flying a subsequent figure which returns the aircraft to the X axis.

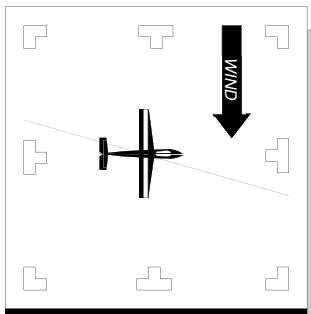


Figure 6

6.7.1.4. A well designed Free Program will always include at least one, and preferably more, wind corrector figures. Not every Known Compulsory or Unknown Program contains sufficient (or any) wind corrector figures. In this case, it is up to the competitor to keep the aircraft within the Aerobatic Box without benefit of a specific Y axis figure to accomplish it. A common approach is to crab into the wind as done in navigational flight. (see Figure 7) Crabbing means that the aircraft's heading is at an angle to the competition axis (X or Y). The downside to this approach is that if this heading angle can be detected by the Judge, a deduction of one (1) point per five (5) degrees will be given.

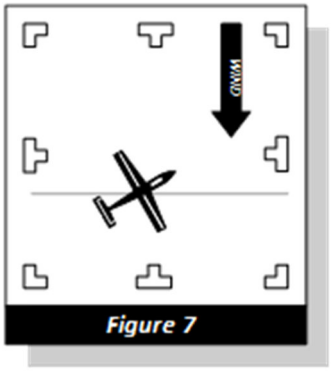


Figure 7

6.7.1.5. It is possible for the competitor to correct for wind in such a manner that the attitude remains absolutely true to the correct geometry of the figure but the flight path has a sideways component. It goes beyond the scope of this document to provide a tutorial on how this may be accomplished, but what is clear is that if any yaw (heading) deviation or bank angle is visible to the Judge, the mark must be reduced at the rate of one (1) point for every five (5) degrees of deviation detected.

6.7.1.6. Please note, however: even if it is plainly evident that the aircraft has moved laterally within the Aerobatic Box, if the method of that movement cannot be detected by the Judge, no deduction for such correction must be made.

6.8. The Two Basic Components of Aerobatic Construction: Lines and Loops

6.8.1. Lines

6.8.1.1. All lines are judged in relation to the true horizon and the Aerobatic Box's axes. Horizontal lines are judged on flight path, not attitude. Different aircraft at different airspeeds will employ different attitudes to maintain a horizontal flight path. (see Figure1)

6.8.1.2. Gliders cannot maintain altitude without losing speed. In order to maintain airspeed, they must fly a descending flight path. The glide angle at constant airspeed is determined by the lift/drag ratio of the specific glider at that speed. So, depending on airspeed and glider type, glide angles may vary considerably.

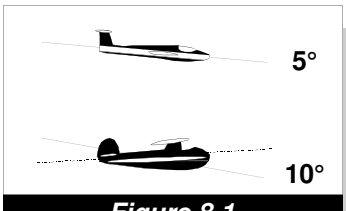


Figure 8.1

6.8.1.3. For this reason, the flight path for horizontal lines in glider aerobatics may be inclined between zero (0) and ten (10) degrees below the horizon (Figure 8.1). Deviations above or below this bracket will be downgraded by one (1) point per five (5) degrees.

6.8.1.4. While maintaining a horizontal flight path, the aircraft's heading must remain parallel to the X or Y axis. The deduction for deviation in either axis is one (1) point per five (5) degrees from the correct geometry.

6.8.1.5. All figures begin and end on definite horizontal lines, and both must be present in order to earn a good mark. A competitor who rushes from one figure to another without showing this horizontal and well-recognizable line will be downgraded by one (1) point for each missing line in each figure affected. Therefore, leaving out the line between two

figures will downgrade the preceding figure by one (1) point and the following figure by one (1) point. (Figure 8.2)

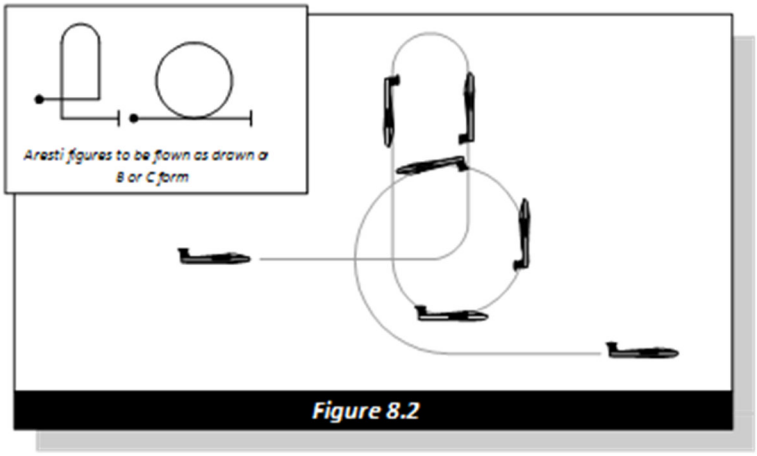


Figure 8.2

6.8.1.6. All lines that occur inside a figure are preceded and followed by part-loops. (Figure 9) The absolute length of lines within a figure is in itself not a marking criterion. The corresponding attitude, however, must be maintained long enough to allow judges to observe the angle and determine any deviations from the prescribed plane of flight.

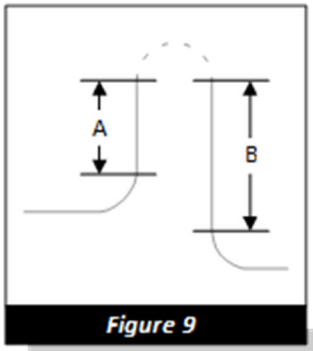


Figure 9

6.8.1.7. Excessively long lines must not be rewarded with higher marks and "rough" flying with high-G "square corners" must be penalized by reducing the mark for harmony.

6.8.1.8. With the exception of Family 3 figures and some figures in Family 7, the criterion for the length of lines within a figure states that they do not have to be of equal length. Therefore, it is imperative that the judges become familiar with the specific criterion for the length of lines for each figure. For example, the lines in a "Humpty-bump" do not need to be of equal length, but all four lines in a "Square loop" must be of equal length. (Figure 10)

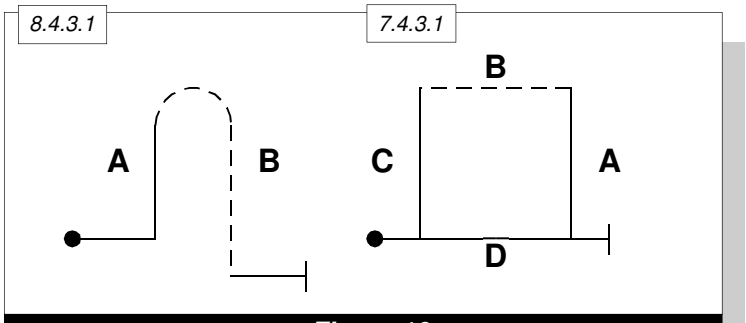


Figure 10

6.8.1.9. Whenever a slow roll or hesitation roll is placed on an interior line, the lengths of the two parts of the line before and after the roll must be equal. In gliders, the entry airspeeds for positive and negative flick rolls lie in a relatively narrow bracket. The pilot must be free, therefore, to determine the point on the line where he starts the flick roll. Because of this, no deduction will be made for flick rolls not centred on an interior line.
The line lengths before and after a roll are not a marking criterion when rolls are performed on a 90 degree down line following a spin.

6.8.1.10. Some gliders have relatively slow roll rates and need practically the entire length of an interior line to complete a slow roll or hesitation roll. Therefore, it is sufficient to fly vertical or 45 degree lines before and after the roll just long enough to show that the preceding part-loop has been completed and the prescribed plane of flight is established. The absolute lengths of the lines before and after the roll are irrelevant for marking as long as they are equal.

6.8.1.11. Judges should take care to judge the symmetry of the length of lines in a figure using only the length of the lines and not by elapsed time taken to fly each segment. This difference in length versus elapsed time is most noticeable in figures where rolls are placed on up-lines. As the aircraft loses airspeed, the time it takes to fly a line after the roll will be longer than the time required to fly the line of the same length before the roll.

6.8.1.12. If within a figure two or more lines must be of the same length, an observed variation is penalised by reducing the mark in the following manner: (Figure 11)

a) a visible variation - one (1) point deduction

b) if the lengths vary by 1:2 or more - two (2) points deduction.

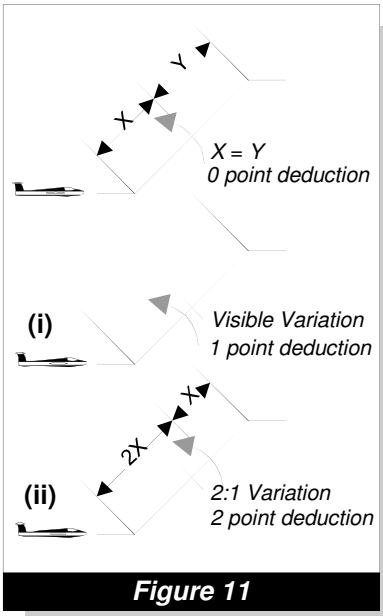


Figure 11

6.8.1.13. The basis for judging line lengths is the first line flown. The absence of one of the lines before or after a roll is penalised by one (1) additional point.

Example: The competitor is to fly a 45 degree up-line with a half aileron roll on this line. Although there was a line before the roll, the glider was returned to level flight immediately after the roll. The correct deduction is three (3) points: two (2) points are deducted because the lengths of the lines differ by more than 1:2, and another one (1) point is deducted because of the absence of one of the lines.

6.8.1.14. All 90 degree and 45 degree lines are preceded by a part-loop. When the glider completes the part-loop and reaches the prescribed plane of flight, the pilot must reduce the angle of attack to maintain the 90 degree or 45 degree attitude. For marking purposes, the judge must only look for the precise alignment of the glider's zero lift axis 45 degrees or 90 degrees relative to the horizon as soon as the part-loop has been completed.

6.8.1.15. Some pilots exaggerate the change in angle of attack when transitioning from loop to line. They overshoot the correct angle by several degrees, and then the nose of the glider is "bumped" back onto the line. Any visible "bump" in the transition from a loop or part-loop onto a line must be penalized by a one (1) point deduction.

6.8.2. Loops and Part Loops

6.8.2.1. All transitions from one plane of flight to another should have a reasonable and constant radius. The size of that radius is not a marking criterion and higher marks must not be given for high-G "square corners". If a stall occurs in a loop or part loop, the figure must be marked Perception Zero (PZ).

6.8.2.2. The loop is a figure from Family 7, but part-loops are integral to every other family so it is necessary to define some key elements before going on to the other families.

a) A loop must have, by definition, a constant radius. It starts and ends in a well-defined line which, for a complete loop, will be horizontal. For a part-loop, however, such lines may be in any other plane of flight and will be defined by the aircraft's attitude. As the speed changes during execution of a loop or part-loop, the angular velocity around the aircraft's lateral axis also has to change in order to keep the radius constant. Thus, the angular velocity can be an aid for the judge to gauge the radius – especially when the angular velocity in the higher part-loop is seen to be faster, as this is a clear indication that the radius is smaller. This aid becomes more important when two part-loops are separated by a line between.

b) Part-loops are depicted either as round elements or as 'corner' angles. It should be noted that any 'corner' angle drawn in the pictograms, such as in Figure 12, is always to be flown as a part-loop and must have a smooth, distinct and constant radius.

c) For any one figure having several internal part-loops depicted as round elements, all such part-loops shall have the same radius – with exception for all of family 8.8 figures (double humpty-bumps) for which the radius of the second part-loop is not required to match the radius of the first one.

d) The radius of any part-loop depicted as a corner angle is not required to match the radius of any other part-loop in the same figure – with exception for all of Family 3 (combinations of lines) and Family 7.4 (whole loops) figures, which must keep a regular geometrical shape and therefore require all part-loops to have the same radius.

6.9. Aresti System (Condensed) Glider Families

6.9.1. Family 1 – Lines and Angles

6.9.1.1. Family 1.1.1 to 1.1.11 has been fully covered in the preceding section. Note that the figures in Family 1.2.1 to 1.3.1 are NOT performed as drawn in the Catalogue. (Figure 12) In each of these figures there are three (four in 1.3.1 - 1.3.8) looping components: a one-eighth loop, a three-eighths loop and a quarter loop. (Figure 13) Rolls may be performed on the 45 degree line and/or the 90 degree line, with the part-lines before and after the roll being of equal length, except positive or negative flick rolls and rolls following a spin.

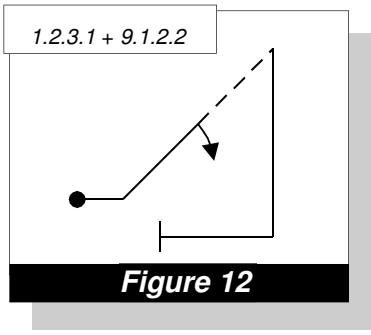


Figure 12

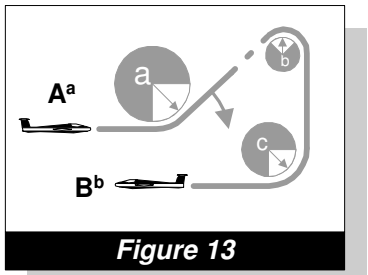


Figure 13

6.9.1.2. The initial horizontal line and the line at the end of the figure may be flown at different altitudes.

6.9.1.3. Figure 13 shows Family 1.2.1-1.2.8 as flown. Radii a, b, and c may all be different and entrance altitude “A” can be different from exit altitude “B”.

6.9.2. Family 2.1.1, 2.2.1, 2.3.1 and 2.4.1 – Turns

6.9.2.1. Competition turns are not to be confused with standard coordinated turns (Figure 14). In aerobatic competition, a turn is divided into three parts:

a) establishing the bank using a roll on heading;

b) the turn itself; and

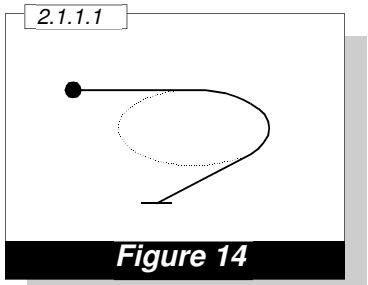


Figure 14

c) a roll back to straight and level flight on heading.

6.9.2.2. First, the roll to establish the bank. This must be a roll of 60 degrees, it must be performed on the entry heading, and the aircraft must maintain a constant glide (0 to 10 degrees below the horizon).

6.9.2.3. Once the roll is completed and the angle of bank is established, the competitor immediately performs the turn. The turn must maintain 60 degrees of bank throughout. The aircraft must also maintain a constant glide (0 to 10 degrees below the horizon). The rate of turn is constant throughout and is NOT wind corrected. Therefore, in wind, a 360 degree turn will not appear as a perfect circle.

6.9.2.4. As soon as the glider is on the exit heading, the competitor performs another roll at a rate equal to the entry roll. Again the aircraft must maintain a constant glide (0 to 10 degrees below the horizon).

6.9.2.5. Downgrades:

a) The angle of bank established by the initial rolling manoeuvre must be exactly 60 degrees. Any deviation is a one (1) point deduction for every five (5) degrees.

b) The angle of bank, once established, must remain constant. Any deviation is a one (1) point deduction for every five (5) degrees of deviation.

c) The rate of roll must be the same for the entry and exit rolls of this figure. Any deviation is a one (1) point deduction.

d) The aircraft must maintain a constant glide (0 to 10 degrees below the horizon) throughout the figure. Any deviation above or below is one (1) point for every five (5) degrees.

e) The rate of turn must remain constant. Any change would be not more than a one (1) point deduction for each change. Note that the rate of turn may appear to change in a strong wind, when it really isn't changing. The Judge must always keep the wind in mind and give the pilot the benefit of the doubt if there is any question.

f) The aircraft must begin and end on the prescribed heading. Any deviation is a one (1) point deduction for every five (5) degrees of deviation.

6.9.3. Family 2.1.2, 2.1.3, 2.2.2 - 2.2.6, 2.3.2 -2.3.5 and 2.4.2 - 2.4.8 – Rolling Turns

6.9.3.1. The rolling turn is a figure that combines a turn of a prescribed amount with a roll or rolls integrated throughout the turn. (Figure 15).

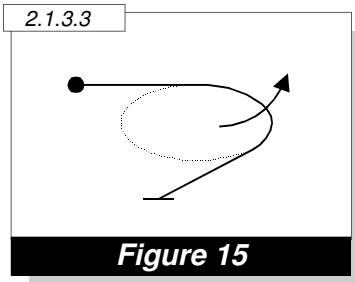


Figure 15

6.9.3.2. These rolls may be in the same direction as the turn and are called "rolls in" or "rolls to the inside". They can be rolls in the opposite direction of the turn and are called "rolls out" or "rolls to the outside". Or there can be rolls alternating in and out.

6.9.3.3. When we say that the rolls are integrated, we are saying that in addition to there being a constant rate of turn throughout the figure, there must also be a constant rate of roll and the rolls must be synchronised with the turn.

6.9.3.4. For example: In a 180 degree rolling turn with two rolls from upright (Catalogue Numbers. 2.2.5.1 or 2.2.5.3) the glider must be inverted after 45 and 135 degrees of turn and upright at 90 and 180 degrees.

6.9.3.5. At the end of the figure the aircraft must be wings level and on the prescribed heading.

6.9.3.6. When a rolling turn is performed with rolls alternating directions, the aircraft must change direction of roll at a wings level attitude whilst continuing the turn. There must be no recognizable pause when reversing roll directions.

6.9.3.7. Downgrades:

a) Performing more or fewer rolls than the catalogue description calls for results in the figure being HZ.

b) All rolls in a rolling turn are slow rolls. If, in the judge's perception, a flick roll is flown or a stall occurs, the figure is graded Perception Zero (PZ).

c) Each visible variation of the roll rate as well as the turn rate is a downgrade of no more than one (1.0) point.

d) Each stoppage of the rate of roll as well as the rate of turn is a downgrade of no more than two (2.0) points.

e) A recognizable pause when reversing roll directions will be downgraded by one (1) point.

f) Variations from the constant glide (0 to 10 degrees below the horizon) are deducted by one (1) point per five (5) degrees.

g) One (1) point for every five (5) degrees of bank when reversing roll direction.

h) One (1) point for every five (5) degrees of roll remaining when the aircraft has reached its exit heading.

i) One (1) point for every five (5) degrees of turn remaining when the aircraft has completed its last roll.

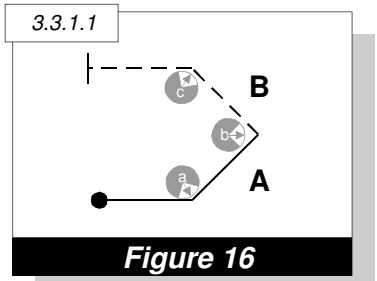


Figure 16

6.9.4. Family 3 – Combinations of Lines

6.9.4.1. The transition from level flight to 45 degree lines should be at a constant and reasonable 1/8th looping radius. All lines within the figure must be equal in length. All part-loops in family 3 shall have the same radius.
(In Figure 16; radii a = b = c)

6.9.5. Family 5 - Stall Turns

6.9.5.1. Stall turns are some of the most graceful figures in the catalogue. In its most basic form, the figure begins when the aircraft leaves horizontal flight and flies a quarter loop to establish a vertical climb. At the top of the vertical line, the aircraft pivots and establishes a vertical descent, with the figure ending as the aircraft is returned to horizontal flight.

6.9.5.2. The judging criteria are:

a) The vertical lines, both up and down, must be flown on the zero-lift axis. (see Figure 2)

b) Any deviation from vertical, either up or down, will result in a deduction of one (1) point per five (5) degrees from the zero lift axis.

c) Any added roll(s) must be in the vertical climb or vertical descent and positioned so that the lines before and after the roll are of equal length (except positive or

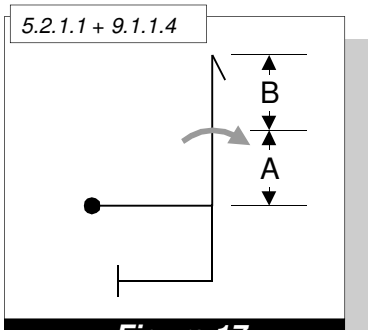


Figure 17

negative flick rolls) (Figure 17). For deductions see 6.8.1.12 and 6.8.1.13.

d) The length of the vertical up and down lines need not be equal. As such, the altitude of the horizontal lines at the start and finish of the stall turn may be different.

e) During the vertical climb or vertical descent, the wings must remain parallel to the horizon. There will be a one (1) point deduction per five (5) degrees, when the line connecting both wing tips deviates from horizontal.

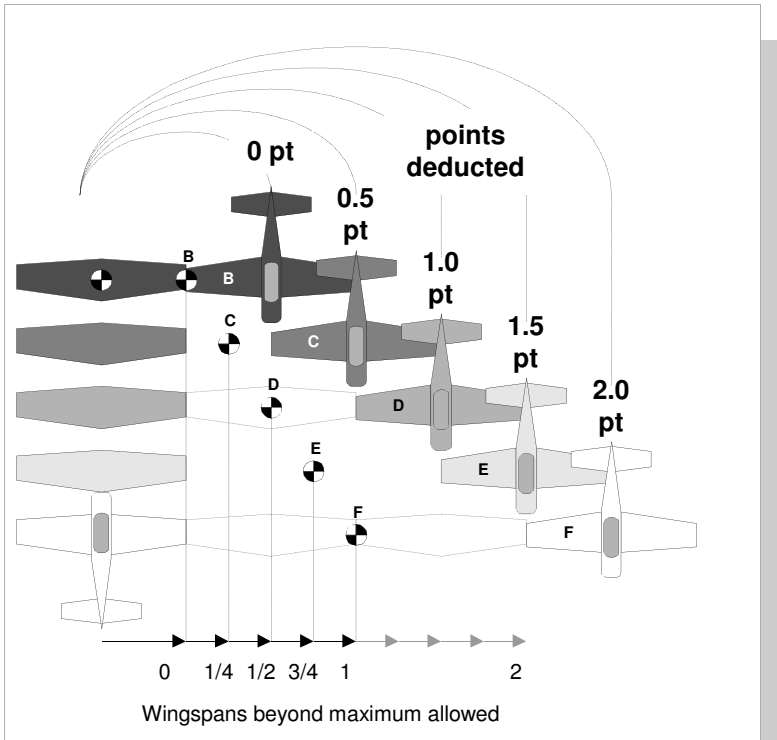


Figure 18

f) As the glider nears the point where it would stop climbing, it must pivot in a plane parallel to vertical. To avoid a deduction, it must pivot around a point which should not be farther away from its centre of gravity than its wingtip. When the radius of the rotation is greater, the downgrade is one (1) point per half wingspan. (Pivot point D, Figure 18)

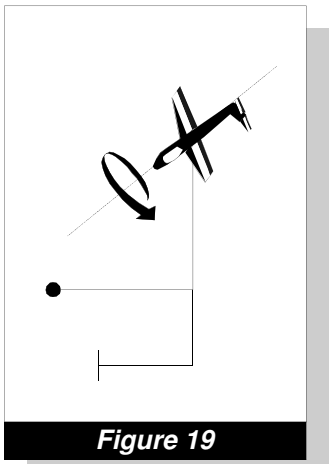


Figure 19

g) The rate at which the aircraft pivots around its vertical axis is not a judging criterion. If, however, the glider slides down sideways whilst pivoting around its vertical axis, this "wing slide" must be downgraded by at least one (1) point depending on the severity of the slide.

h) The wings must remain in the vertical geometric plane throughout the turnaround, and the aircraft's attitude before and after the turnaround must be absolutely vertical, with no pitch or roll. There must be no rotation around the longitudinal or lateral axes. If there is movement around any axis other than the yaw axis, often referred to as "torquing" (Figure 19), there is a deduction of one (1) point for each five (5) degrees off axis.

6.9.6. Family 6 – Tailslides

6.9.6.1. All the criteria of the Stall Turn apply to this figure except, of course, for the manoeuvre at the top of the vertical climb. At the point when the aircraft stops, it must slide backwards a visible amount (the key here is "a visible amount"). If there is no slide, the grade is Perception Zero (PZ).

6.9.6.2. Following the slide backwards, the aircraft must then tip over and fall through to a diving position. The tipping over must be around the lateral axis only. Any movement around another axis is downgraded by one (1) point per five (5) degrees.

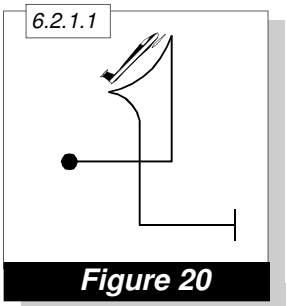


Figure 20

6.9.6.3. Often the nose will swing back or "pendulum" past the vertical after falling through. The figure is not to be downgraded for this, nor downgraded if it does not happen. It is a function of the length of the slide and the type of aircraft, and is not to be considered in marking the figure.

6.9.6.4. There are two types of tailslide: wheels-down (also called "canopy-up") and wheels up (also called "canopy-down"). The wheels-down tailslide is depicted in the Aresti diagram with a curved solid line at the top of the tailslide symbol. (Figure 20) The wheels-up tailslide is depicted in the Aresti diagram with a curved dashed line at the top of the tailslide symbol. (Figure 21) This figure must be watched carefully, as the aircraft can fall the wrong way (which is marked Hard Zero) with the correct direction of flight and the proper aircraft attitude still maintained. Wings should stay level with the horizon throughout and not drop during the slide or the fall through. Watch for the aircraft rolling off the correct plane of flight, which must be downgraded.

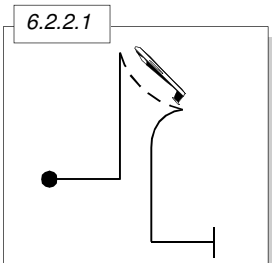


Figure 21

6.9.6.5. Also watch for "cheating" on the vertical line up in the direction of the slide just prior to sliding. (Figure 22) The entry quarter loop and the exit quarter loop must be flown with reasonable and constant radii. The altitude of the entry and exit horizontal lines need not be the same and the radii of the entry and exit quarter loops may be different.

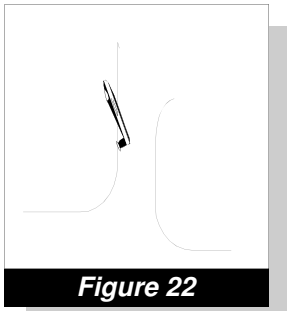


Figure 22

6.9.6.6. When rolls are combined with Family 6 figures, there must be an equal length of line before and after the roll(s) (except positive or negative flick rolls). In the vertical down line, the aircraft must attain a vertical attitude and establish a down line before starting the roll(s).

6.9.6.7. In summary, the aircraft should make a smooth and steady transition up to vertical flight, the wings should stay level in relation to the horizon, and the aircraft should come to a complete stop in this attitude. After sliding backward a visible amount, it should fall through in the appropriate direction without dropping a wing or the nose moving off axis, and recover on the same plane as that of entry. After completion of this, it should again project the 90 degree down line before transitioning into horizontal flight with a quarter loop of reasonable and constant radius.

6.9.7. Family 7 – Loops and Figure 8's

6.9.7.1. The size of a loop is not a marking criterion. It will vary according to the flight characteristics of the aircraft. A large loop is not marked any higher or lower than a small loop. But any variation to the radius will downgrade these figures.

6.9.8. Family 7.2. – Half-Loops With Rolls

6.9.8.1. The half-loops in this sub-family must be of a constant radius and wind-corrected to appear as a perfect half circle (see full loops discussion below).

6.9.8.2. When a half-loop is preceded by a roll or rolls, the half-loop follows immediately after the rolls without any visible line. Drawing a line requires a downgrade of at least two (2) points depending on the length of the line drawn. Should the half-loop begin before the roll is completed, the Judge must downgrade the figure one (1) point for every five (5) degrees of half-loop flown on which the roll was performed.

6.9.8.3. The half-loop followed by a roll is also flown with no line between the half-loop and roll. Again, drawing a line requires a downgrade of at least two points depending on the length of the line drawn. Should the roll begin before the half-loop is completed, the Judge must downgrade the figure one (1) point for every five (5) degrees of half-loop on which the roll was performed. (Figure 23)

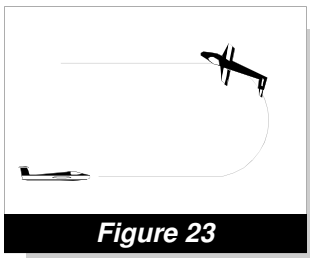


Figure 23

6.9.8.4.

6.9.9. Family 7.3 – Three Quarter Loops

6.9.9.1. Sometimes referred to as "Goldfish", none of the part-loops in these figures need be of the same size. Entry and exit lines are judged with reference to the 45 degree attitude, not flight path. Any rolls, except positive or negative flick rolls on the 45 degree lines must be centred on that line. The lengths of the two 45 degree lines may be different and the entry and exit altitudes need not correspond to the altitude limits of the loop. (Figure 24)

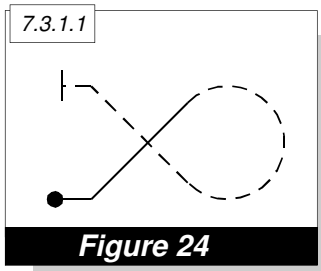


Figure 24

6.9.10. Family 7.4.1 - 7.4.2 – Round Loops

6.9.10.1. All full loops must appear perfectly round to the Judge. This means that they must be wind corrected to have a constant radius. This wind correction is only with regards to the roundness of the loop and not for the effect of any crosswind on the figure. Therefore, no deduction is given if the finish point is displaced relative to the start point in a direction perpendicular to the plane of the loop. Full loops must also begin and end at the same altitude or they will be downgraded. (Figure 25.1)

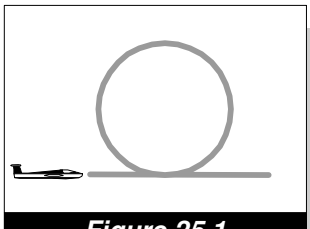


Figure 25.1

6.9.10.2. In glider aerobatics, the entry and exit lines of the loop may be inclined 0 to 10 degrees below the horizon and the inclination may be different for entry and exit lines within the above tolerances (Figure 25.2).

6.9.10.3. Loops must be flown with no visible crabbing and wings must be level at all times. The one (1) point for every five (5) degrees rule holds for both these cases.

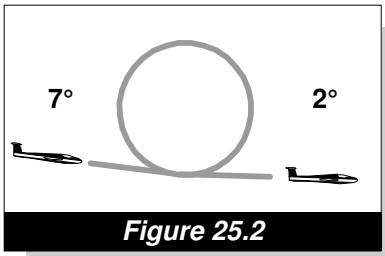


Figure 25.2

6.9.10.4. If there is a roll or rolls at the apex of the loop, it must be centred in the loop and flown on the arc of the loop itself. Flying the roll on a line at the apex of the loop is at least a

two (2) point downgrade. If the roll is not centred, it must be downgraded one (1) point for every five (5) degrees of the arc that it is off centre.

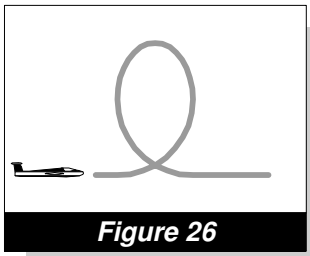


Figure 26

6.9.10.5. To better quantify deductions for irregularity of the radius of looping figures, the Judge divides the loop into quadrants. Any variation in the radius from one quadrant to the next can be downgraded a fixed number of points depending on the magnitude of the variation.

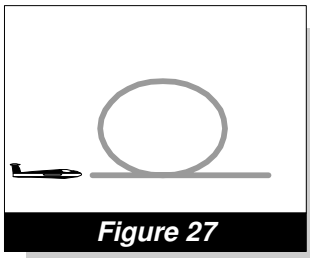


Figure 27

6.9.10.6. The goal of each Judge is to develop a reproducible method to judge all loops with the same criteria. In judging loops, a common error is for the vertical diameter of the loop to be larger than the horizontal diameter. This is often called an "L" shaped loop (Figure 26).

6.9.10.7. Less common are loops with a horizontal diameter greater than the vertical. This is called an egg-shaped or pumpkin-shaped loop (Figure 27).

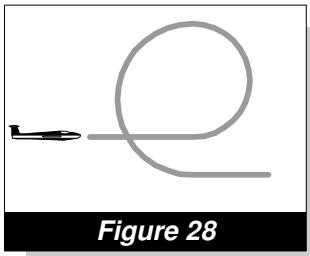


Figure 28

6.9.10.8. Another common error is in varying the radius of the final quadrant performing an "e" shaped loop (Figure 28).

6.9.10.9. Whatever method is used, standard downgrades should be applied for each of these errors. Additional downgrades should be applied based on the magnitude of variation.

6.9.11. Family 7.4.3 - 7.4.6 – Square, Diamond and Octagon Loops

6.9.11.1. Square and Octagon loops are flown as hesitation loops with lines of equal length and partial loops with equal radii. All horizontal lines are judged on flight path and vertical and diagonal lines are judged based on aircraft attitude. As such, except in a windless condition, the judge should never expect to see these figures closed. They will always be driven by the wind. Square and Octagon loops are not considered complete until the last horizontal line is drawn equal to the length of the first line of the figure.
In Figure 29:
Radii a = b = c = d
Line Length A = B = C = D
Figure is not complete until D = A

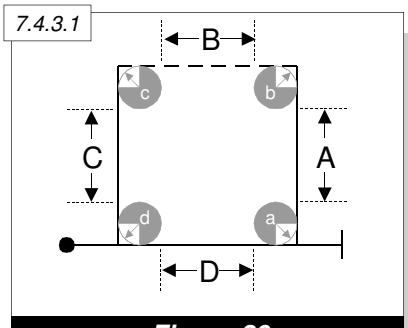


Figure 29

6.9.11.2. Where rolls are flown on the Square or Diamond loops, they must be centred on the line (except positive or negative flick rolls).

6.9.11.3. Aids for judging all hesitation loops are that a good performance will contain changes of angular velocity in all the partial loops, and variations of time taken to draw the length of each interior line, which also varies according to the aircraft's speed. The rhythm of all these partial loops is a help for judging. A frequently seen error in hesitation loops is for the aircraft to overshoot the partial loop and then have to bring the nose back to correct the attitude. This must be downgraded by one (1) point for every five (5) degrees.

6.9.12. Family 7.4.7 - 7.4.14 – Reversing Whole Loops

6.9.12.1. Judging criteria for roundness are the same as for round loops (see 6.9.10): The reversing loop must be wind corrected with all partial loops having the same radii.

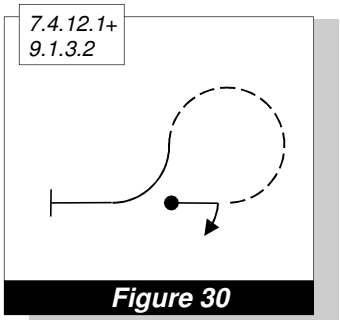


Figure 30

6.9.12.2. The reversing loop must be a continuous looping figure with no line at the point where the pitch direction changes. Adding a line between the two partial loops is at least a two (2) point deduction depending on the length of the line.

6.9.12.3. Criteria for rolls on entry and exit lines are the same as for half loops (see 6.9.8). Criteria for rolls at the apex of the loop are the same as for round loops (see 6.9.10).

6.9.13. Family 7.5.1 - 7.5.8 – Horizontal S's

6.9.13.1. Both looping segments must have the same radius. For rolls on the horizontal entry and exit lines the criteria for Family 7.2 apply. Rolls on the internal 45 degree line must be centred except positive or negative flick rolls.

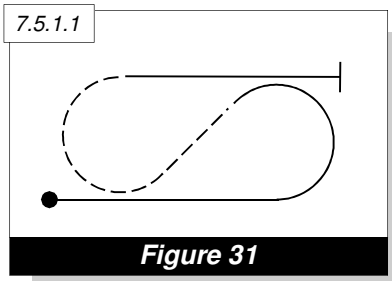


Figure 31

6.9.13.2.

6.9.14. Family 7.8.1 - 7.8.8 – Horizontal 8's

6.9.14.1. The 5/8 and 3/4 loops must have the same radius, but the radius of the 1/8 loop between 45 degree and horizontal line need not equal the radii of the other loops.The lines between the loops are flown at exactly 45 degrees attitude. Rolls on the 45 degree lines must be centred except positive or negative flick rolls. For deductions see 6.8.1.12 and 6.8.1.13.

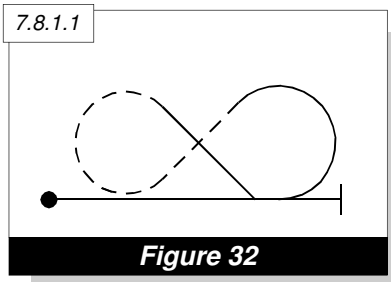


Figure 32

6.9.14.2. The start and finish of the figure and the bottoms (or tops if the figure is reversed) of the two loops need not be at the same altitude. For rolls on the horizontal entry or exit lines before or after the 5/8 loop, the criteria for half loops apply. (Figure 32)

6.9.15. Family 7.8.9 - 7.8.16 – Horizontal Super 8's

6.9.15.1. Besides containing three 45 degree lines on which rolls may potentially be placed, these sub-families should be judged like 7.8.1 - 7.8.8 but with the addition of an extra 45° line.

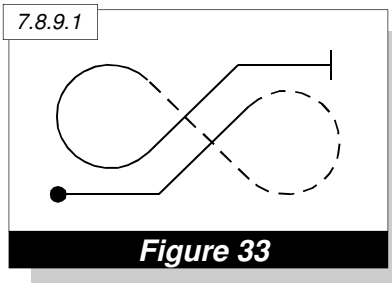


Figure 33

6.9.15.2. The two 3/4 loops must have the same radius but due to glider flight mechanics cannot occur at the same height. The entry and exit 1/8 loops must have a reasonable and constant radius, but need not be the same size as either the 3/4 loops or each other. Rolls placed on any 45 degree line must be centred, except positive or negative flick rolls. The height of the entry and exit lines bears no relationship to the height of the two 3/4 loops. (Figure 33).

6.9.16. Family 8 – Combinations of Lines, Loops and Rolls

6.9.16.1. These figures are combinations of horizontal, vertical and 45 degree lines as well as partial loops of varying degrees. The judging criteria for these lines and loops are unchanged. What is left to discuss are the judging criteria for the combinations of these lines and loops.

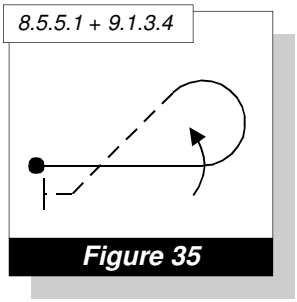


Figure 35

6.9.17. Family 8.4 – Humpties

6.9.17.1. These figures, whether vertical or performed with 45 degree lines, are judged as combinations of lines and loops. None of the radii of the various part-loops need be equal. The half loops in all family 8.4 figures must still have a constant radius from the time they depart the vertical or 45 degree line. This requires a change in angular velocity during the half loop. (Figure 34)

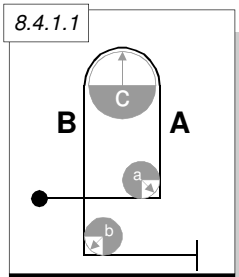


Figure 34

6.9.17.2. The lines in these figures may be of different lengths, and therefore the entry and exit altitudes of these figures can be different. Rolls on any of these lines except positive or negative flick rolls and rolls following a spin must be centred.

6.9.18. Families 8.5.1 - 8.5.8, 8.6.1 - 8.6.8 and 8. 7 – Half Cubans, Reverse Half Cubans, P-Loops and Q-Loops

6.9.18.1. In these figures, none of the part-loops need to have the same radii. Rolls on vertical and 45 degree lines except positive or negative flick rolls and rolls following a spin must be centred. Horizontal rolls immediately preceding or following looping segments have the same criteria as Family 7.2. For rolls at the apex of P- or Q-Loops, the criteria for round loops apply.

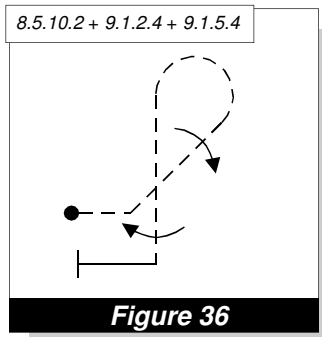


Figure 36

6.9.19. Family 8.5.9 - 8.5.24 – Teardrops

6.9.19.1. None of the internal part-loops need to have the same radii. The rolls on vertical and 45 degree lines except positive or negative flick rolls and rolls following a spin must be centred. Angles are to be flown as part-loops. (Figure 36)

6.9.20. Families 8.6.9 - 8.6.16 and 8-10 – Reversing P-Loops and Reversing 1¼ Loops

6.9.20.1. When 1/4, 1/2 and 3/4 loops depicted as round elements join each other in these Families, their radii must be equal and there is no line between the loops. (Figure 37) A line drawn would be a minimum two (2) point deduction depending on the length of the line. The part-loop depicted as a corner angle, should have a reasonable radius, but need not match the other looping radii. For rolls on the entry and exit lines, the same criteria apply as for Family 7.2 (half loops with rolls). For rolls at the apex of the half or three-quarter loop segments, the criteria for Family7.4.1 - 7.4.2 (round loops) apply.

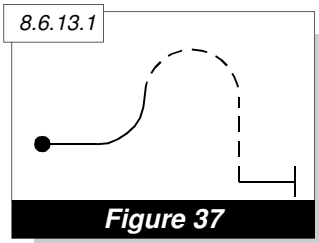


Figure 37

6.9.21. Family 8.8 – Double Humpties

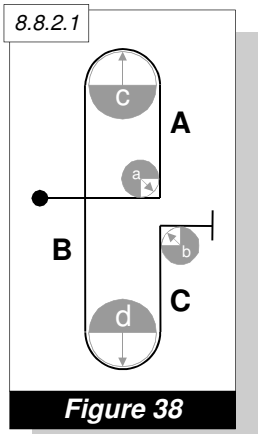


Figure 38

6.9.21.1. These comprise of three vertical lines and two 180° looping segments (Figure 38).

6.9.21.2. In view of the markedly different speeds possible during the looping segments, none of the radii (a, b, c, d) have to be equal (but each must be internally constant). There is no requirement either for any relation between the vertical line lengths. All other criteria for humpty-bumps apply (see 6.9.17).

6.9.22. Family 9 – Rolls and Spins

6.9.22.1. Rolls may be performed on horizontal, 45 degree or 90 degree lines; on complete loops; between part-loops; between part-loops and lines; and following spin elements.

6.9.22.2. They may be 1/4, 1/2, 3/4 or a full 360 degrees in their rotation, up to two consecutive full rolls. Additionally, slow rolls may be flown in combination with turns as prescribed in Family 2 (Rolling Turns).

6.9.22.3. In all cases, the same criteria apply: the rate of roll must be constant throughout the roll(s). The aircraft should continue to project, during the rolling portion, the prescribed plane and direction of flight.

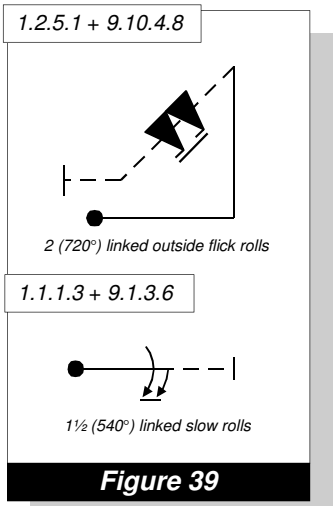


Figure 39

6.9.22.4. Multiple rolls may be linked, unlinked, or opposite.

a) When rolls are in continuous rotation, the tips of the symbols are linked by a small line. When flying linked rolls there is no pause between them. (Figure 39)

b) Unlinked rolls must be of different types, the two types being defined as follows:

c) Aileron rolls (slow rolls and hesitation rolls)

d) Flick rolls (positive and negative)

e) With unlinked rolls, no line links the symbols, though their tips are drawn pointing in the same direction (i.e., on the same side of the line). They must have a brief but perceptible pause between them and they are to be flown in the same direction of rotation. (Figure 40)

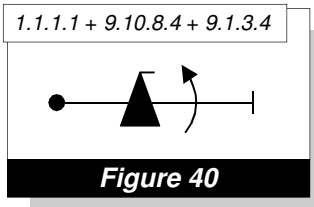


Figure 40

f) Opposite rolls may be either of the same or different type. In opposite rolls, the tips of the symbols are drawn on opposite sides of the line, indicating they are to be flown in opposite directions of rotation. The pilot may elect to fly the first roll in either direction, but the second roll must be opposite direction to the first. Opposite rolls, including those in rolling turns, should be flown as one continuous manoeuvre - the brief check between opposite rotations should be minimal. (Figure 41) If the two rolls are of the same type, they must be flown in opposite directions if they are not linked.

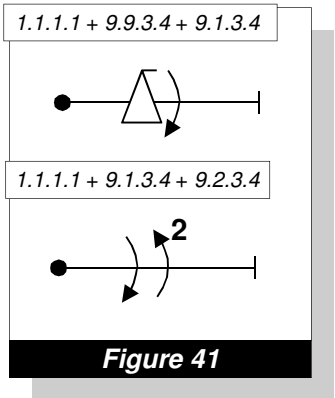


Figure 41

g) Either aileron or flick rolls may follow spin elements (Family 9.11 or 9.12). When a spin and a roll are

combined on the same vertical down line they will always be unlinked; may be flown in either the same or opposite direction, as shown by the position of the tips of the symbols on the Form B or C; and the combination may not exceed two rotational elements. (For example, it would be illegal to combine two opposite direction aileron rolls with a spin element.)

6.9.23. Families 9.1 and 9.13 – Slow Rolls and Super-Slow Rolls

6.9.23.1. The penalty for varying the rate of roll is one (1) point per variation. Any stoppage in the slow roll that could result in its being considered a hesitation roll, would hard zero (HZ) the figure. The finish of the roll must be as crisp and precise as possible. Coming to a slow finish in fact represents a change in the rate of roll and should be penalized accordingly.

6.9.23.2. The marking criteria for Super-Slow Rolls are identical to Slow Rolls, but the average rotation rate of Super-Slow Rolls must not be more than 36 degrees per second (minimum 5 seconds for one half roll; 10 seconds for one roll; 15 seconds for one and one half roll)

6.9.23.3. The wings must stop precisely after the desired degree of rotation and not go past the stop point and then return. This is referred to as "bumping the point". A deduction of 0.5 point to one (1) point is given depending on the severity of the "bump"

6.9.24. Family 9.2 - 9.8 – Hesitation Rolls

6.9.24.1. These rolls are judged on the same criteria as the slow roll, only the aircraft stops rotation during the roll for a pre-stated number of times, i.e., 2, 4 or 8. The rate of the roll and the rhythm of the hesitations must be constant throughout with the aircraft projecting the pre-stated plane and direction of flight. The pauses will be of identical duration and the degree of rotation correct between each pause: 180 degrees, 90 degrees, or 45 degrees. Each pause of a hesitation roll must be clearly recognizable in every case, but it is especially important that in poor visibility or at high altitude, the competitor pauses long enough to make them recognizable to the Judges. If a pause is not recognizable to a judge, the figure is marked a Hard Zero (HZ).

6.9.24.2. "Bumping the point" will be downgraded by 0.5 point to one (1) point depending on the severity of the "bump" for each occurrence.

6.9.25. Family 9.9 – Positive Flick Rolls

6.9.25.1. Flick rolls represent one of the greatest challenges to judges. This is largely due to two factors: (1) the "flicking" characteristics of different types of gliders vary because of variations in wing section, wing span and wing planform; and (2), in properly executed flick rolls changes of attitude occur very quickly. Judges must watch particularly carefully to determine the exact order in which events occur, especially at the beginning of the flick.

6.9.25.2. The judge must see two things to determine that a flick roll has been correctly initiated. The aircraft must achieve an angle of attack close to critical, usually involving a rapid change of pitch attitude, and autorotation must be initiated by application of the rudder. If the judge does not observe both events, the figure must be given a PZ. The size of the pitch change may vary considerably due to the requirements of the figure in which the flick is performed. When, for instance, a flick roll is initiated at the top of a loop, the aircraft can be expected already to be carrying quite a high angle of attack and the amount of pitch change that is required may be much less than in other circumstances.

6.9.25.3. At the start of a positive flick roll, the pitch attitude must change in the 'nose up' sense, from the pilot's perspective, clearly and unambiguously (Figure 42). This puts the aircraft's wings near the critical angle-of-attack and can best be seen by carefully watching either the nose or tail of the glider. If the fuselage pitches in the wrong direction, a hard zero (HZ) is given. When, or shortly after, the fuselage pitches the glider must be seen to yaw, initiating a stall of one wing and the rapid onset of autorotation. If the judge observes any movement about the roll axis before the autorotation starts, the figure must be downgraded one (1) point per five (5) degrees of roll.

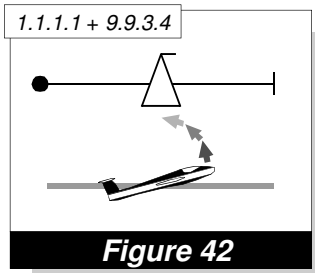


Figure 42

6.9.25.4. Throughout the flick, the roll must be driven primarily by the rudder and autorotation must be seen to continue. This can best be confirmed by the observed conical motion of the fuselage longitudinal axis, with the most obvious displacement at the tail, which is furthest from the CofG. This should not be confused with the spiral motion of a tight barrel roll, wherein the centre of gravity of the glider more noticeably follows a spiral flight path. The rate of rotation and the angle, relative to the flight path, of the conical fuselage rotation may vary between glider types, but the rate of rotation is always considerably faster than when rolled by ailerons. This is an essential clue for the judge to determine that the glider has indeed been flicked.For all aircraft types, the criteria for stopping the flick roll are the same: autorotation must stop as quickly as it started, after the desired extent of roll, followed immediately by the adoption of the attitude that conforms to the requirements of the underlying figure. Downgrades for minor errors in the extent of rotation or the following flight path or attitude are penalised at the normal rate of 1 point per 5 degrees.

6.9.25.5. Flick rolls must be observed very carefully to ensure that the rotation is driven throughout by the asymmetry in yaw induced by continual rudder application and that the competitor is not "aileroning" the aircraft around its longitudinal axis without the conical fuselage motion. The movement of the aircraft's nose departing the flight path prior to autorotation is a good clue to the proper initiation of a flick roll and the continued conical motion of the tail is indicative that autorotation is continuing. When a glider does not stall and autorotation is not achieved, it will follow a spiral flight path similar to a high-rate barrel roll. As always, the competitor is given the benefit of the doubt, but if a judge is certain that a proper flick roll has not been initiated, a PZ is given. Another common error is for the aircraft initially to autorotate, but to not stay in autorotation until the end of the figure. In this case, a deduction of one (1) point for each five (5) degrees of rotation remaining when the autorotation stops must be made. If autorotation ends with more than 45 degrees of rotation remaining, even if the roll is completed with aileron, the flick roll is awarded a numerical zero (0.0).

6.9.26. Family 9.10 – Negative Flick Rolls

6.9.26.1. For negative flick rolls, all criteria stated for positive flick rolls apply except that the aircraft is in a negative rather than positive angle-of-attack during autorotation. Therefore, in a negative flick roll the nose and tail of the aircraft must initially move in the 'nose down' sense, from the pilot's perspective, as the angle of attack is changed (Figure 43). This direction of motion must be observed very carefully, since it is the

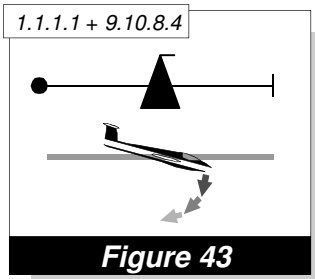


Figure 43

defining characteristic that differentiates a negative flick roll from a positive flick roll. As with positive flick rolls, if the nose does not move in the correct direction, it is not a negative flick roll and the figure must be given a hard zero (HZ). In other respects relating to the characteristics of the rotation and errors to be observed, the criteria are the same as for positive flicks.

6.9.26.2. Judges should be aware, however, that nearly all aerobatic gliders have cambered wing sections and down elevator authority is more limited than up. Therefore, the negative "flicking" characteristics may be quite different from positive flicks. In general, gliders appear to be more "reluctant" to flick inverted and negative flick rolls may not look as "crisp" as positive ones. Again, the competitor should be given the benefit of the doubt and the judge should also use the rate of rotation as a clue that the glider has been flicked.

6.9.27. Family 9.11 and 9.12 – Spins

6.9.27.1. Spin elements may be combined with any Family 1 or Family 8 figure which begins on a vertical down line. Rolls may follow a spin on the same line.

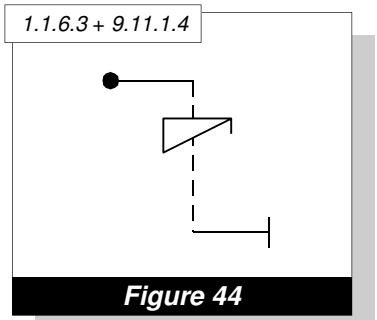


Figure 44

6.9.27.2. All spins start from horizontal flight. In order to spin, the aircraft must be completely stalled on a clearly visible horizontal line near its minimum airspeed. In a correct spin entry, the nose of the glider drops and autorotation starts simultaneously around the longitudinal and vertical axes. If autorotation around the vertical axis is visibly delayed in relation to the roll around the longitudinal axis, entry airspeed was too high, the glider was “flicked” into the spin and the figure must be marked Perception Zero (PZ).

6.9.27.3. During spin entry and in the spin, the flight path is affected by wind. When the spin is entered with a tailwind, the flight path may suggest that the spin entry was "forced". This change in appearance is not a marking criterion. (Fig. 45)

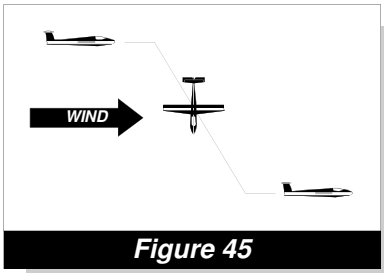


Figure 45

6.9.27.4. After completion of the prescribed number of turns, the aircraft must stop rotating precisely on the pre-stated heading, then a 90 degree down, wings-level attitude must be seen. Marking criteria for the basic figure being flown then resumes. If a roll follows a spin, there should be a brief, but perceptible pause (similar to unlinked rolls) between the spin and the roll. Because there is no vertical line before the spin, there is no criterion to centre either a spin element alone or a spin-roll combination on the vertical down line.

6.9.27.5. Be alert for early stopping of the stalled autorotation followed by "aileroning" to the pre-stated heading. In this case, a deduction of one (1) point for every five (5) degrees of "aileroning" must be applied. For example, in a one-turn spin the autorotation is observed to stop after 345 degrees of rotation and the ailerons are used to complete the rotation. The highest score this spin could receive is a 7.0. The same obviously applies for over-rotating and correcting back to the prescribed heading.

6.9.27.6. No account is to be taken of the pitch attitude of the aircraft during autorotation, as some aircraft spin in a nearly vertical attitude while others spin quite flat in conventional spins.

Speed of rotation is also not a judging criterion. If the aircraft never stalls, it is apparent that it cannot spin, and a Perception Zero (PZ) must be given. You will see "simulated" spins where barrel rolls or flick rolls are offered as spin entries. In both cases, the flight path will not be downward. In all of these cases, the figure will be graded PZ.

6.9.27.7. In all spins the marking criteria are:

a) A clean breaking stall in horizontal flight.

b) Fully-stalled autorotation.

c) Stopping on pre-stated heading.

d) 90 degrees down, wings-level attitude after stopping on heading.

6.10. Positioning

(See paragraph 5.1.4).

6.10.1.1. Positioning is marked by the individual judges.

6.10.1.2. Positioning refers to the placement of the figures in relation to the X and Y axes of the performance zone. Additionally, positioning relates to the placement of each figure at its optimum distance from the judges, taking into account the height of the glider and the nature of the figure being flown. Lastly, positioning also refers to the symmetrical placement of the entire sequence in relation to the lateral (Y) axis of the performance zone.

6.10.2. Optimal Placement of Figures

6.10.2.1. Accurate flying is best assessed when the judge’s sight line is neither too high nor too low above the horizon. On the other hand, a glider continuously loses height whilst flying an aerobatic sequence. In practise this means for the pilot, in order to place his figures optimally that he should not fly too close to the judges whilst high up and not too far away from the judges toward the end of the sequence at lower altitude.

6.10.2.2. This must also consider the character of the figure flown. For example:

a) A loop or 45 degree line cannot be judged accurately when flown too close to the judges.

b) A rolling turn at low altitude, flown away from the judges, is much harder to assess than flown towards the judges.

6.10.3. Sequence Symmetry

6.10.3.1. A sequence should be flown so that it is symmetrically placed in relation to the lateral (Y) axis of the performance zone. Particularly under wind influence, the pilot must try to balance his sequence so it remains centred on the lateral axis.

6.11. Harmony

(See paragraph 5.1.5)

6.11.1.1. The harmony of a glider programme is judged on the following criteria:

a) Energy management,

b) Appropriate and even rhythm,

c) Figure separation,

d) Figure spacing,

e) Directional control.

6.11.1.2. The basic idea behind the Harmony mark is to measure the quality of those aspects of a glider sequence which are not covered by the marks for the individual figures nor by the positioning mark.

6.11.1.3. Excessively hard, high-G manoeuvring in a glider programme is poor energy management and violates the principle of harmony. If a pilot flies unnecessarily hard pull-ups or shows excessively long vertical and/or 45 degree lines throughout his sequence, the harmony mark should be reduced by two (2.0) points.

6.11.1.4. The entry airspeed for the next figure should be established upon exiting the preceding figure. If a pilot uses the lines between figures to gain or dissipate speed, this indicates poor energy management and must be reflected in a reduced harmony mark. (see 5.1.5.2.d)).

6.11.1.5. Changing the flight path angle within an entry/exit line is also one half (0.5) point per occurrence.

6.11.1.6. There will be no downgrade on harmony if the competitor is forced to gain or dissipate speed between figures due to non-harmonic construction of a compulsory programme (see 5.1.5.1.a)).

6.11.1.7. Another important factor of harmony is an appropriate and even rhythm throughout a glider programme. The competitor should fly his figures with clear separation and even spacing. The lines between figures must have a constant flight path angle and should be of even length, taking into account varying speeds. Flying unduly long horizontal lines or lines of greatly varying length, as long as this is not necessary to compensate for strong winds (paragraph 5.1.5.1.b)), should be downgraded by one half (0.5) point per occurrence.

6.11.1.8. A programme interruption must result in a reduction of the harmony mark by two (2.0) points. If the judge is overruled on a programme interruption, his harmony mark will nevertheless not be adjusted afterwards.

6.11.1.9. Good directional control is paramount for harmony. If there is a directional deviation greater than 45 degrees in a figure or exiting a figure and the competitor must correct his alignment in the horizontal plane, the harmony mark should be reduced by one (1.0) point per occurrence. When this correction is done in the vertical plane, even if the figure is zeroed for directional deviation, it will not influence the harmony mark.

6.11.1.10. Any figure flown in the wrong direction reduces the harmony mark by one (1.0) point. If the judge is overruled on this HZ, the harmony mark must not be adjusted afterwards.

6.11.1.11. Hard Zeros given for any other reasons (omitted figures, wrong figures, figures started behind the judges etc.) have no influence on the harmony mark.

7. CODE OF PRACTICE FOR THE CHIEF JUDGE AND BOARD OF JUDGES AT WORLD GLIDER AEROBATIC CHAMPIONSHIPS

7.1. The Chief Judge

7.1.1.1. The Chief Judge's primary concern should be the accurate and fair judging of the competition flights, including the monitoring of flights for Hard Zero marks and penalties. He should place his expertise at the disposal of the Board of Judges, and coordinate and guide their work.

7.1.1.2. The Chief Judge oversees administrative matters (correctness of paperwork, recording of penalties, etc.) but must be provided with two Chief Judge Assistants under his supervision who will perform at least the following tasks along with other duties as requested:

a) Calling the manoeuvres and recording the notes of the Chief Judge, to whatever extent he requires.

b) Processing and expediting the flow of paperwork.

c) Receiving and recording the calls of the Boundary Judges.

d) Handling all other radio communications. One of his assistants should assist in monitoring the zero marks and penalties awarded by the Judges after each flight.

7.1.1.3. The Chief Judge shall brief and direct a non-competing pilot nominated by the organisers to demonstrate the 'low' and 'disqualification' heights around the performance zone prior to the commencement of contest flying each day. This demonstration will normally comprise:

a) Flight along the four boundary lines, dipping the wing above the corners and the centre points.

b) Flight along the two main axes, dipping the wing above the 'T's and the centre marker.
The Chief Judge should clearly announce to all judges the 'low' or 'disqualification' height being flown, and draw attention to the appearance of the demonstrating aeroplane with particular reference to:

c) Its proximity to the ground, to assist later assessments of low flying and

d) indications of the box boundary with respect to notable local / surrounding features, to provide a sound basis for assessment of the positioning mark.

7.1.1.4. It is essential that the Chief Judge follows each flight, with emphasis on recording hard zeroes, interruptions and height penalties. Such infringements and comments should be recorded, as an aide-memoire, on a score sheet which should be retained for reference prior to the judges score sheets being submitted to the workstation. The official recording of penalties will be on the appropriate section of the score sheet reserved for the use of the Chief Judge and entered prior to submission to the scoring system.

7.1.1.5. The Chief Judge must hold seminars with the Judges, at least one of which will be with Team Managers or other team representatives present (rule 4.1.6.2). He should give guidance to the Judges as to the current Judging Criteria and rules for judging, on which he should conduct "question and answer" sessions.

7.1.1.6. The Chief Judge will hold other routine evaluation meetings with the Judges during the contest (rule 4.1.6.2) He should insure that the Code of Practice is understood and

operates smoothly, and establish a good working relationship between teams of Judges and Assistants, Timekeepers, and other helpers.

7.1.1.7. The Chief Judge is responsible for ensuring that there is enough time between flights for the judging to be unhurried. He should control (by radio) the flow from one contestant to the next.

7.1.1.8. At the end of each flight, the Chief Judge should ascertain whether any of the Judges have recorded a Hard Zero (HZ) mark, height penalty, interruption penalty or “Behind judges” remark . This will be done by perusal of the score sheets collected from the judges, prior to entry into the scoring system.

7.1.1.9. In the case of a difference of opinion with regards to a Hard Zero (HZ) mark, height penalty or interruption penalty, a judging conference will always be held to resolve differences. The official video shall be available to assist in such discussion when it concerns a matter of fact.
A Judge may request a viewing of the video during such a conference. This request must be honoured by the Chief Judge.
The video should also be used to determine whether the HMD signal was received before or after the completion of a figure and thus whether a low penalty is justified in accordance with paragraph 5.2.1.1 b).

7.1.1.10. In case of a vote among the Judges on the question of penalisation, all judges shall vote regardless of nationality, see also paragraph 5.1.1.3.

7.2. Hard Zeros

7.2.1.1. The awarding of Confirmed Hard Zero marks is determined by the Chief Judge, if necessary after a judging conference. When a Judge’s vote is over-ruled, upward correction of a Hard Zero will be to a Fitted Value determined by the scoring software. When awarding a Hard Zero, judges are to write down the nature of the error and are not to give a ‘reserve’ mark. A Judge has the right to ask for a video review, if it is determined that his written score is incorrect and he is not in agreement with this ruling.

7.2.1.2. The Recommended procedure for handling Hard Zeroes and penalties on the judging line can be broken down as follows:

7.2.2. Hard Zeros given by the Majority of Judges

7.2.2.1. The score sheets go to the scanner unchanged, the Chief Judge having checked the Confirmed Hard Zero (CHZ) box on the score sheet, unless a conference to confirm the facts is demanded by any judge(s). The computer system changes the minority scores to HZ and determines the judges’ HZI points for Section 8.8.4.

7.2.3. Hard Zeros given by 50% or less of the Judges

7.2.3.1. The Chief Judge first determines by means of conferencing whether the Hard Zero is correct or not. If correct, the Chief Judge will check the “CHZ” box on the score sheet; if not he will leave it blank. The judges must not change their score sheets as a result of the discussion. The score sheets will then go to the scanner and the computer system will then change the incorrect grades and determine judges’ HZI points for Section 8.8.4.

7.2.4. Errors in Recording Hard and Perception Zeros

7.2.4.1. The Chief Judge will examine the reasons given by the scoring judges for the award of Hard Zeroes and Perception Zeroes. If a scoring judge has made a mistake and quoted a reason not applicable to the recorded mark, e.g. "HZ: No slide" where the figure is a

tailslide, the Chief Judge will instruct that the scoring judge change his mark to PZ. If however, the Judge has recorded for a tailslide "PZ: Fell the wrong way" then the Chief Judge will instruct the scoring Judge to change his mark to HZ. In this way true zeroes can all be brought to a common solution, providing correction to the judge and clarity for the pilot.

7.2.5. Hard Zero Index (HZI)

7.2.5.1. The Hard Zero Index (HZI) will be calculated by the computer, based on the grades given by the judges and the status of the “CHZ” box.

7.3. Height and Interruption Penalties

7.3.1.1. Each judge must record such infringements on their score sheet. Where there are no such infringements the words “No Penalties” or “NP” should be entered in the remarks box, thus giving a positive indication in either instance. The Chief Judge or his assistant will then enter the appropriate penalty based on the majority result. In the case of a 50/50 split the Chief Judge may call a conference or cast his vote as appropriate.

7.3.1.2. The awarding of penalties for infringements of upper and lower height limitations is decided by majority vote of the judges. In the case the required simple majority could not rise from a vote within the Board of Judges, the Chief Judge shall have the casting vote.

7.3.1.3. The Chief Judge, assisted by the timekeepers, determines whether a super-slow roll was within the time limits (rule 5.3.3.1.f)). He will also award the penalties for improper wing rocking (rule 5.2.6).

7.3.1.4. Judges evaluation by flight programme will be conducted by the International Jury using the software programme approved by CIVA. The Chief Judge will receive a complete analysis of all Judges from the International Jury.

7.4. Judges' Performance Evaluation

7.4.1.1. Judges evaluation by flight programme will be conducted by the International Jury using the software programme approved by CIVA (see Section 8.8). The Chief Judge will receive a complete analysis of all Judges from the International Jury after each programme is completed.

7.4.1.2. Their own individual judging analysis will be given to each judge, during a discussion with the Chief Judge, between programmes.

7.4.1.3. The complete judging analysis of the whole contest will be made available to NACs after the competition has been completed.

7.5. The Judges

7.5.1.1. It is required that all Judges use an experienced Judge's Assistant (see 2.1.5.2). Judges who do not provide such an Assistant will be excluded.

7.5.1.2. All Judges should obtain and study copies of all contestants' Free Programmes before flying of the programme is started.

7.5.1.3. A Judge may only reconsider his marks so long as his score sheet is still in his possession or if asked to do so at the request of the Chief Judge. Once entered into the scoring system, the scoring sheet comes under the jurisdiction of the International Jury. The judge himself must sign off any changes on the score sheet.

7.5.1.4. The preliminary flights by non-competing pilots (rule 4.1.9.1) will be marked exactly as if they were competitors; bearing in mind that the purpose of these flights is so that the first competing pilot who follows them shall not be penalised by receiving an unduly low `anchor' mark.

7.5.1.5. Judges must record as many comments on the score sheets as possible, with particular reference to significant errors. They may make these comments in any language or form, provided that they are able to explain the comments if required.

7.5.1.6. A judge will not make improper communication to third parties by means of cell phone, radio, or other device whilst on the judging line or during breaks/lunches. Failure to adhere to this instruction may lead to expulsion from the judging line.

8. STATISTICAL METHOD FOR PROCESSING SCORES

8.1. The CIVA Fair Play System - Purpose

8.1.1.1. Calculation of grades and scores for an aerobatic competition Programme using a mathematical process to give equal importance to all judges, while replacing anomalous grades with statistically fitted values.

8.2. Overview

The rating of a pilot performance for a given flight is an amount of points arising from two separate sources:

8.2.1.1. An evaluation of the quality of flown figures and of a flight's positioning with a grade given by judges observing the flight, on a scale ranging from 0 to 10 in increments of 0.5. These grades are multiplied by difficulty coefficients for each figure and added to derive a score for the programme for each pilot.

8.2.1.2. Penalties arising from height or time infringements and/or interruptions of the program sequence and other disciplinary actions.

8.2.1.3. The scores from 8.2.1.1 are subject to random and systematic errors due to the inevitable lack of exactness of judging. The purpose of the Fair Play system is to reduce the effect of those errors to a minimum. The penalties from 8.2.1.2 are not subject to the same errors and are simply subtracted from the scores results 8.2.1.1 after they have been calculated as described below.

8.3. Pre-Processing

8.3.1. Dealing with Hard Zeros and Missed Figures

8.3.1.1. Prior to the scoring data being entered into the computer, the Chief Judge must ascertain the validity of Hard Zero grades. If a figure is determined to have been a Confirmed Hard Zero, this must be designated by the Chief Judge. The grades given to that figure by the grading judges must not be altered prior to being input into the computer.

8.3.1.2. For a figure determined not to be a Confirmed Hard Zero, any "HZ" grade given by a grading judge must remain unaltered prior to data entry into the scoring computer.

8.3.1.3. Figures that have been missed by a grading judge must be marked "A". These missing grades will be replaced automatically by the Fair Play system.

8.3.2. Identifying Figure Grades for Analysis

8.3.2.1. Prior to the start of the Programme, the data input to the scoring computer will include the number of pilots, the number of figures (including positioning and, for gliders, harmony) each pilot will fly, the K-factors of each figure and the number of judges for the programme.

8.3.2.2. Each figure will be given a full identifying number in the format ***kkkffpp*** where:

a) kkk is the K-factor, with leading zeroes if necessary, e.g. "037" if K-factor =37

b) ff is the figure number, with leading zeroes if necessary, and

c) pp is the pilot number, with leading zeroes if necessary.

8.3.2.3. Note that the number pp allocated to a pilot must remain the same throughout a contest and should not be confused with the flight order number any pilot may be allocated for a particular programme.

8.3.3. Grouping Figure Grades for Analysis

8.3.3.1. Statistical manipulation must only be carried out on sets of data of reasonable size. Furthermore, such analysis is best conducted on sets of data that share similar source characteristics. To meet these requirements, the grading data from a programme must be combined into appropriate groups.

8.3.3.2. For the purpose of the Fair Play analysis, data will be arranged in groups in the following generalised format:

K-factor	Figure #	Pilot #	Judge 1	Judge 2	…	…	Judge j
Kkk_1	ff	pp	$Grade_{1,1}$				
Kkk_2	ff	pp					
Kkk_3	ff	pp					
…	…	…					
…	…	…					
kkk_n	ff	pp					$Grade_{n,j}$

8.3.3.3. In such a data set, the arrangement of rows will be by ascending value of the full figure Identification Number kkkffpp. In compulsory programmes, Known and Unknown, all pilots fly the same figures and the number of rows per data group will normally be the same as the number of pilots. This means that each data group in a compulsory sequence will correspond to a figure of that sequence flown by all pilots, in the form:

K-factor	Figure #	Pilot #	Judge 1	Judge 2	…	…	Judge j
kkk	Figure 1	Pilot 1	$Grade_{1,1}$				
kkk	Figure 1	Pilot 2					
kkk	Figure 1	Pilot 3					
…	…	…					
…	…	…					
kkk	Figure 1	Pilot p					$Grade_{p,j}$

8.3.3.4. Exceptionally, if the number of pilots is less than 11 (see 1.2.3), the target number of rows for each group (NrmGrp) will be as follows:

Number of Pilots	2	3	4	5	6	7	8	9	10
Group Size	12	12	12	15	12	14	16	18	20

8.3.3.5. In Free Programmes, where pilots fly different figures and/or numbers of figures, additional information is required so that the figures included in each data group are reasonably similar in type and complexity. Therefore each figure in a Free Programme (including Positioning and Harmony grades) will additionally be allocated to a Super-Family. Super-Families are defined as follows.

Super-Family Numbers (FF)	Unlimited Power	Adv & Y52 Power	Gliders
Harmony			00

Positioning	01	01	01
Aresti family 2	02	02	02
Figures containing spins	Spins ignored	03	03
Figures without spins but with flicks	Flicks ignored	04	04
Aresti family 5	05	05	05
Aresti family 6	06	06	06
Aresti families 1, 3, 7 and 8	07	07	07

Notes: In Unlimited Power, Spins and Flicks are ignored and the Super-Family depends only on the Aresti Family of the underlying figure. If either Super-Family 05 or 06 contains less figures than the minimum of 11 data points, these two Super-Families will be combined.

8.3.3.6. Hence a Full Free Figure Identification Number will be of the form FFkkkffpp.

8.3.3.7. Free Programmes

a) In the Positioning and Harmony Super-Families, the group size will equal the number of pilots, i.e. each will contain the complete Super-Family. If the number of pilots (Np) whose flights have been judged is < 11, however, (see 1.2.3) then these Super-Families will be combined into a group containing them both.

b) In other Super-Families, comprising aerobatic figures, the data groups will be formed from within each Super-Family, unless Np is less than 11. The target number of rows for each group (NrmGrp) will be the number of pilots whose flights have been judged, while the minimum group size (MinGrp) will remain 11 rows. When Np < 11, then NrmGrp will be as tabulated in 8.3.3.4, and a group may contain figures from more than one Super-Family. When a Super-Family contains more figures than the number of pilots, it may thus be split into two or more groups.

   i) The boundary between adjacent groups within a single Super-Family will be made preferably at the change of K-factor nearest the target size within the range ‘target row to target plus minimum rows’, or if this is not successful nearest the target size but between the target row and the minimum group size. If no change of K-factor is available the group boundary will be set at the target row.

   ii) For example, suppose that a Free Programme has 40 pilots and that Super-Family 07 contains 250 figures. This data will be divided into a number of groups, each of which will contain approximately 40 rows. The final group will contain at least 11 rows.

8.3.3.8. No analysis should be started until all groups contain at least 5 rows of numerical data. Results calculated by FPS are liable to change until all data have been entered. Once the data have been compiled into groups, the analysis will proceed as follows in 8.3.4

8.3.3.9. Free Unknown Programme

a) In the Free Unknown Programme, the International Jury will give the seven common figures code letters “A” to “G” at the time of submission, and these letters must be maintained as the identifier for that figure in each sequence.

b) The Jury will annotate the linking figures (maximum two) in each sequence, with the figure codes “L1” and “L2” sequentially.

c) The Harmony and Positioning figure codes will be the normal “00” and “01” Super-Families as used for other types of sequence.

8.3.3.10. Grouping of Free Unknown figures

a) In the figures with codes “A” to “G”, the data groups will be formed from within each figure code, unless Np is less than 11. The target number of rows for each group (NrmGrp) will be the number of pilots whose flights have been judged, while the minimum group size (MinGrp) will remain 11 rows. When Np < 11, then NrmGrp will be as tabulated in 8.3.3.4, and a group may contain figures from more than one figure code.

b) In the linking figures coded “L1” and “L2”, the data groups will be formed from within each figure code, unless Np is less than 11. The target number of rows for each group (NrmGrp) will be the number of pilots whose flights have been judged, while the minimum group size (MinGrp) will remain 11 rows. When Np < 11, then NrmGrp will be as tabulated in 8.3.3.4, and a group may contain figures from more than one linking figure code.

c) In the Positioning and Harmony Super-Families, the group size will equal the number of pilots, i.e. each will contain the complete Super-Family. If the number of pilots (Np) whose flights have been judged is < 11, however, then these Super-Families will be combined into a group containing them both.

8.3.4. Confirmation of Hard Zero

8.3.4.1. The first stage of processing is to set to “HZ” all numerical grades given to a figure subsequently deemed to be a Confirmed Hard Zero by the Chief Judge. Any grade thus reduced to “HZ” must result in an increment to the particular judge’s record for determining the HZ anomaly count of the Judging Performance Analysis.

8.3.4.2. Once Confirmed Hard Zeros have been implemented, each pilot’s score sheet should be printed and made available for inspection along with the judges grading sheets.

8.3.5. Treatment of Other “HZ” or of “A” Grades

8.3.5.1. If a figure is not deemed to be a Confirmed Hard Zero, any “HZ” or “A” grades given for that figure must be treated as missing data points. Such grades will therefore be excluded from the calculation of means or standard deviations until such time as they are replaced later in the process. For each “HZ” grade that is not confirmed, an increment will be made to the judge’s HZ anomaly count.

8.3.6. Treatment of Perception Zero Grades

8.3.6.1. Perception Zero grades are not subject to the same confirmation process as Hard Zeros. They are generally treated as valid numerical grades in the same way as non-zero grades. However, Perception Zero grades should not influence the normalisation of non-zero grades that is described below.

8.4. Definitions

8.4.1. The Basic Data Values

8.4.1.1. Define the Raw Grades, for a given sequence, as:
S(ff, pp, j)

This is the Grade awarded by Judge *j* to Pilot *pp* flying Figure *ff.*

8.4.1.2. These Grades are then divided into semi-homogeneous Groups as defined above, and are now defined as:
R_g(fp, j)

This is the Grade awarded by Judge *j* to (Pilot *p* flying Figure *f*) in Group *g*, and is represented physically by a rectangular array of numbers where *fp* is the row index and *j* is the column index.

8.4.1.3. There should also be a count indicator of values 0 and 1 to indicate 0 for any PZ, HZ or A values. These are designated: $N_g(fp, j)$

8.4.1.4. Counts

a) Pilot Count = No. Judges who score this pilot/figure combination

$$\mathbf{C_g(fp, *) = \Sigma_j \{N_g(fp, j)\}} \quad \mathbf{(1)}$$

b) Judge Count = No. Pilot/figures scored by this judge

$$\mathbf{C_g(*, j) = \Sigma_{fp} \{N_g(fp, j)\}} \quad \mathbf{(2)}$$

c) Overall Count = Total number of Scores

$$\mathbf{C_g(*, *) = \Sigma_{fp,j} \{N_g(fp, j)\}} \quad \mathbf{(3)}$$

8.4.1.5. Mean Values

a) Pilot Mean

$$\mathbf{mR_g(fp, *) = \Sigma_j \{R_g(fp, j)\}/C_g(fp, *)} \quad \mathbf{(4)}$$

b) Judge Mean

$$\mathbf{mR_g(*, j) = \Sigma_{fp} \{R_g(fp, j)\}/C_g(*, j)} \quad \mathbf{(5)}$$

c) Overall Mean

$$\mathbf{mR_g(*, *) = \Sigma_{fp,j} \{R_g(fp, j)\}/C_g(*, *)} \quad \mathbf{(6)}$$

8.4.1.6. Standard Deviations

a) Judge Standard Deviation

$$\mathbf{sdR_g(*, j) = sqrt([\Sigma_{fp} \{R_g(fp, j)\}^2 - C_g(*, j)*\{mR_g(*, j)\}^2]/[C_g(*, j) - 1])} \quad \mathbf{(7)}$$

b) Average Judge Standard Deviation

$$\mathbf{sdR_g(*,) = \Sigma_j \{sdR_g(, j)\}/J} \quad \mathbf{(8)}$$

8.5. Group Processes

8.5.1. Normalisation of a Data Group

a) The first stage of the analysis is to Normalise the non-zero grades in the data group to give each judge's column of grades the same standard deviation. This will give equal importance to each judge's opinion. In the normalisation formula:

b) $Norm1_g(fp,j)$ is the Normalised grade to replace the Raw grade
$sdR_g(*,j)$ is the standard deviation for a judge's Raw grades in this group
$sdR_g(*, *)$ is the standard deviation for all the Raw grades in this group from all judges and,

$$\mathbf{Norm1_g(fp,j) = mR_g(*,*) + [R_g(fp,j) - mR_g(*,j)] * sdR_g(*,) / sdR_g(*,j)} \quad \mathbf{(9)}$$

8.5.1.2. If the result of formula (7) or (8) is zero, then formula (9) cannot be applied and the grades for this judge, or this group, should be set to the overall mean for this group. If the result of formula (9) is less than zero, then it should be set at zero.

8.5.1.3. Perception Zero (PZ) grades are excluded from this normalisation process because, for each judge, these form part of a second mode of distribution of raw grades. After the

non-zero grades are normalised, the Perception Zero grades are set to 0.0 so that they are included in the process of determining Fitted Values and figure anomalies. Hence:

If Rg(fp,j) = 0.0, Then Norm1g(fp,j) = 0.0 **(9a)**

8.5.2. Derivation of Fitted Values

8.5.2.1. Within the data group, a Fitted Value for a figure grade for a pilot is the grade that you would expect a particular judge to give a particular pilot/figure combination, based on an analysis of all the judges' grades for all the pilot/figure combinations in the group, including numerical zeroes (SZ) but excluding factual zeroes (HZ). In the Fitted Value formula:

a) $FV1_g(fp,j)$ is the Fitted Value derived from $Norm1_g(fp,j)$
$mNorm1_g(*,j)$ is the mean of the Normalised numerical grades in the group for that judge
$mNorm1_g(fp,*)$ is the mean of the Normalised numerical grades in the group for that pilot/figure
$mNorm1_g(*, *)$ is the mean of all the Normalised numerical grades for that group for all judges and,

$$\mathbf{FV1_g(fp,j) = mNorm1_g(*,j) + mNorm1_g(fp,*) - mNorm1_g(*, *)} \quad \textbf{(10)}$$

8.5.3. Assessment of Anomalous Grades

The normalised grades in each group must be tested for anomalies caused by judging error or partiality.

8.5.3.1. The Uncertainty of Any Individual Data Point

a) A data point (grade) will be considered anomalous if its uncertainty exceeds a given threshold value. This uncertainty is derived by a two-way analysis of variance and starts with the calculation of the Residual for each data point. In the Residual formula:

b) $Res1_g(fp,j)$ is the Residual value for each data point in the group after the first normalisation, and,

$$\mathbf{Res1_g(fp,j) = Norm1_g(fp,j) - FV1_g(fp,j)} \quad \textbf{(11)}$$

c) $RSS1_g$ is the Residual Sum of Squares for the data group after normalisation and,

$$\boldsymbol{RSS1_g = \sum_{fp,j}\{Res1_g(fp,j)\}^2} \quad \textbf{(12)}$$

8.5.3.2. The Degrees of Freedom of the data group is determined by:

a) D_g is the value of the Degrees of Freedom of the data group
FP_g is the number of pilot/figure rows in the group
J_g is the number of judges in the programme (columns in the data group)
Nm_g is the number of missing values (HZ or A) in the group, and

$$\mathbf{D_g = \{[FP_g - 1] * [J_g - 1]\} - Nm_g} \quad \textbf{(13)}$$

8.5.3.3. The Residual Standard Deviation of the data group, $RSD1_g$, is determined by:

$$\mathbf{RSD1_g = sqrt\{RSS1_g / D_g\}} \quad \textbf{(14)}$$

8.5.3.4. Finally, the uncertainty of each individual data point, $U1_g(fp,j)$ is calculated:

$$\mathbf{U1_g(fp,j) = ABS[Res1_g(fp,j)] / RSD1_g} \quad \textbf{(15)}$$

8.5.4. Treatment of Anomalous Grades

8.5.4.1. If the uncertainty of an individual grade, $U1_g(fp,j)$, exceeds 2.24 it has an uncertainty of approximately 97.5%. This degree of anomaly, or more, is to be expected in the case of

a small number of perception zeroes for a figure which generally attracts a majority of high grades. Similarly, such an anomaly might occur if a single judge missed a large pilot error that led all other judges to award a very low grade. Anomalies such as this should be treated as though they were missing values. This treatment will give the benefit of the doubt to the pilot in situations where it is possible that a very significant judging error has been made.

8.5.4.2. The raw grade for any data point showing such an anomaly should be set to "Missing" in the original Raw Data Rg(fp, j) – call it R2g(fp, j). The judge concerned should have an increment made to Low or High Score anomaly count in the Judging Performance Analysis, as appropriate, for each grade replaced.

8.5.4.3. When making judgements based on the perception of the quality of flick rolls or spins, the panel of judges might produce a series of grades in which the distribution is bi-modal rather than Gaussian. For example, a set of grades might possibly include a number of perception zeroes and a number of high grades. In extremely rare cases, this difference of opinion may be so great that the majority of raw grades might be considered anomalous by this analysis. In this situation it is not fair to assume that the remaining grades are truly representative of the pilot's performance of the figure concerned.

8.5.4.4. Therefore, if the number of missing values that would be carried forward to the second normalisation exceeds 60% of the number of judges, all grades for this figure by this pilot should be replaced by the FV1 value derived at Formula 10.

8.5.5. Second Normalisation of the Group

8.5.5.1. If anomalies have been removed from the raw grades, the data set will have more missing values. It would therefore be necessary to normalise the data group for a second time. Again, Perception Zero (PZ) grades must be excluded from the Normalisation and these grades must remain 0.0. Using only the remaining non-zero grades new values must be determined for $mNorm_g(*,j)$, $mN_g(fp, *)$, $mN_g(*, *)$ and thus $FV_g(fp,j)$.

a) Hence,

$$\mathbf{Norm2_g(fp,j) = mR2_g(*.*) + [R2_g(fp,j) - mR2_g(*,j)] * sdR2_g(*,) / sdR2_g(*,j)} \quad \mathbf{(16)}$$

b) and,

$$\mathbf{FV2_g(fp,j) = mNorm2_g(*,j) + mNorm2_g(fp,*) - mNorm2_g(*, *)} \quad \mathbf{(17)}$$

8.5.5.2. These new fitted values will have been determined free from the influence of any anomalous grades and are thus robust and give the benefit of any doubt to the pilot in the case of minority perception zeroes for an otherwise highly-graded figure.

8.5.6. Replacement of Missing Grades

8.5.6.1. These $FV2_g(fp,j)$ values are then used to replace the HZ, A and 'Missing' anomalous grades carried forward from the preceding analysis.

8.5.6.2. The judge concerned should have an increment made to his Low Score or High Score anomaly count in the Judging Performance Analysis, as appropriate, for each anomalous grade replaced, as well as to the HZ anomaly count for any HZ replaced.

8.5.6.3. After these replacements, the second normalised grades will be the final processed grades for each data group.

8.5.7. Assembly of Processed Grades by Pilot

8.5.7.1. After processing in the separate data groups, the final processed grades must be combined into a single matrix and this table sorted by ascending value of the Pilot identification number and then the figure number. These grades are then multiplied by the respective K-factor for each figure and totalled to give:

a) SR(p,f,j) an overall score for each pilot on each figure from each judge

8.5.7.2. These can then give:

a) SR(p,f,*) an overall score for each pilot for each figure over all judges, where:

$$\mathbf{SR(p,f,*) = \Sigma_j\ SR(p,f,j)} \quad \mathbf{(18)}$$

b) SR(p,*,j) an overall score for each pilot for each judge over all figures, where:

$$\mathbf{SR(p,*,j) = \Sigma_f\ SR(p,f,j)} \quad \mathbf{(19)}$$

c) SR(p,*,*) an overall score for each pilot, where:

$$\mathbf{SR(p,*,*) = \Sigma_{f,j}\ SR(p,f,j)} \quad \mathbf{(20)}$$

8.5.7.3. These data should be printed and passed to each pilot at the earliest possible stage, so that the changes made during the processing stage can be understood.

8.6. Sequence Processes

8.6.1. Normalisation of Sequence Scores

8.6.1.1. It is now necessary to repeat the normalisation process at the sequence stage, once again to ensure that the opinion of each judge is given the same importance.

8.6.1.2. The sequence score data, SR(p,j), can be set out in a matrix form as shown here.

Pilot #	Judge 1	Judge 2	Judge 3	…	…	…	Judge j
Pilot 1	SR(1,1)	SR(1,2)	…	…	…	…	…
Pilot 2	SR(2,1)	…	…	…	…	…	…
Pilot 3	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…
Pilot p	…	…	…	…	…	…	SR(p,j)

8.6.1.3. From this table:

a) mSR(*,j) is the mean of all the scores given by Judge j.
sdSR(*,j) is the standard deviation of all the scores given by Judge j.
sdSR(*,*) is the average standard deviation of all the scores given to all the pilots by all the judges, and

$$\mathbf{NormS(p,j) = mSR(*,j) + [SR(p,j) - mSR(*,j)] * sdSR(*,*) / sdSR(*,j)} \quad \mathbf{(21)}$$

8.6.2. Derivation of Sequence Fitted Values

8.6.2.1. Next sequence fitted values are derived from the normalised scores to enable calculation of standardised residuals at the sequence level. In this derivation:

a) mNormS(*,j) is the mean of all the normalised scores given by Judge j.
mNormS(p,*) is the mean of all the normalised scores given to Pilot p.
mNormS(*,*) is the mean of all normalised scores given by all judges to all pilots, and

$$FVS(p,j) = mNormS(*,j) + mNormS(p,*) - mNormS(*,*) \quad (22)$$

8.6.3. Assessment of Sequence Anomalies

8.6.3.1. Despite the replacement of anomalous figures at the earlier stage of the process, it might be possible for slight, consistent favouritism or subconscious bias to influence unduly a Judge's overall score for a pilot. Such a score might be high or low and should be replaced if its degree of uncertainty reaches approximately 90%.

8.6.3.2. Therefore the analysis must next derive the residuals for the sequence scores:

$$ResS(p,j) = NormS(p,j) - FVS(p,j), \text{ and} \quad (23)$$
$$RSS_s = \sum_{p,j}\{ResS(p,j)\}^2 \quad (24)$$

8.6.3.3. The number of degrees of freedom for the sequence data set is calculated where:

a) D_s is the value of the Degrees of Freedom of the sequence data
P_s is the number of Pilots in the sequence
J_s is the number of judges in the sequence
Nm_s is the number of missing values (confirmed HZ for all figures by a pilot), and

$$D_s = \{[P_s - 1] * [J_s - 1]\} - Nm_s \quad (25)$$

8.6.3.4. The Residual Standard Deviation for the sequence is given by:

$$RSD_s = sqrt\{RSS_s / D_s\} \quad (26)$$

8.6.3.5. The uncertainty of each sequence score is given by:

$$US_s(p,j) = ABS[ResS(p,j)] / RSD_s \quad (27)$$

8.6.3.6. If this uncertainty figure exceeds 1.65 (90%) it must be replaced by the fitted value FVS(p.j).

8.6.4. Interim Final Sequence Score

8.6.4.1. The processed sequence score for each pilot will be the sum of the normalised sequence scores over judges, after replacement of anomalous values of NormS(p,j) by fitted values FVS(p,j).

8.6.4.2. $PS(p) = \sum_j\{NormS(p,j) \text{ or } FVS(p,j)\} / Nj$ (28)

8.6.4.3. Penalties awarded for whatever reason are subtracted from this processed score to give each pilot's final overall score for the sequence.

8.6.4.4. $FS(p) = PS(p) - Pen(p)$ (29)

8.6.5. Second FPS Iteration and Final Sequence Score

8.6.5.1. When flights are of a very low standard, it is unlikely that the judges will show the same consistency of grading as when flights are of a high standard. Therefore, such low standard flights can have undue influence over the way in which the FPS system treats other scores.

8.6.5.2. To prevent such undue influence, the following procedure will be followed if the total number of competing pilots exceeds 30:

a) Determine the values of PS(p) as a percentage of the maximum possible score for the sequence.

b) If this value is less than 60% for a known sequence (Programmes Q, 1 and 4), or less than 50% for an unknown sequence, temporarily remove these flights raw data from

the whole data set and re-apply the FPS process in its entirety. This will generate more reliable results for the retained pilots.

c) Publish the final ranked order, based on FS(p) from the first FPS iteration for the excluded, low-scoring pilots, and based on FS(p) from the second FPS iteration for the retained, higher scoring pilots.

8.7. Process Summary

8.7.1. The process carries out the following analytical steps:

8.7.1.1. Sets confirmed Hard Zeros to HZ for all judges

8.7.1.2. Treats unconfirmed HZ and A grades as “Missing” at this stage.

8.7.1.3. Arranges figure grades into data groups for further analysis.

8.7.1.4. Within each data group:

a) Normalises the grades to give equal importance to each judge.

b) Derives fitted values for each judge for each figure.

c) Determines if any normalised grades are more than 95% uncertain and disregards them by setting them to “Missing”.

d) Derives revised normalised grades and fitted values taking account of the new missing data.

e) Replaces all the missing grades with revised fitted values.

8.7.1.5. At the sequence level:

a) Normalises the scores to give equal importance to each judge.

b) Derives fitted values for each judge for each pilot.

c) Determines if any scores are more than 90% uncertain and replaces them with fitted values.

8.7.1.6. In the Second Iteration:

a) Repeats the FPS process excluding certain low-scoring flights.

b) Recombines all results into a final ranking order.

8.8. Judging Performance Analysis

The Fair Play System generates judging analysis data from the raw and FPS-processed scores. A Ranking Index is derived and judging errors totalled in a number of different categories. This data is gathered by the FPS and made available to the International Jury after each sequence and may, at the Jury’s discretion, be passed on the Chief Delegates of each national team at the completion of each Programme, or at the end of the contest.

8.8.1. Ranking Index (RI)

8.8.1.1. The Ranking Index measures how closely an individual judge’s pilot ranking for a programme conforms to the overall ranking based on all judges’ assessments. It is derived by comparing the ranking each judge would have provided for each pilot if no other judges were present (*Jrank*) with the overall ranking calculated from the combined judging panel after all anomalies have been resolved and prior to any penalties being included (*Prank*). In the event that *Jrank* and *Prank* differ, this difference is weighted by an amount proportional to the differences in the underlying sequence scores that lead to

this difference. A ranking error is penalised more heavily when it involves a larger difference in scores than when only minor differences in scores are the cause.

8.8.1.2. To derive the “raw” Judge rankings (Jrank), all HZ and PZ grades are set to numerical zero (0.0) and any “A” grade is assumed missing. This array of data is then normalised, and Fitted Values determined using normal FPS techniques. “A” grades only are replaced with FV and then a pilot total score is calculated by multiplying each normalised figure mark by the relevant K Factor. If a PZ mark is determined to be an anomaly, then it is set to "Missing" and replaced with a FV before final calculation of the Judge rankings.

8.8.1.3. After the full FPS process is complete, a full panel score (Pscore) and ranking (Prank) is determined for each pilot prior to the application of any penalties.

8.8.1.4. To derive the “Raw” Judge scores (Jscore), a final normalisation is conducted to rescale each judge’s all-pilot average “raw” scores and all-pilot average standard deviation of “raw” scores (as calculated in 8.8.1.2) to be the same as the all-pilot average and standard deviation of the full panel score (calculated in 8.8.1.3).

8.8.1.5. An index is now derived from these data for each judge. This takes account of differences in ranks and differences in total scores. Thus:

8.8.1.6.

$$RI = \left\{ \sum_{1}^{Np} \frac{abs(Jrank - \mathrm{Pr}ank) * abs(Jscore - Pscore)}{Pscore} \right\} * \frac{20}{(0.0057 * Np^2) + (0.1041 * Np)}$$

8.8.1.7. Typically, a judge’s Ranking Index will be in the range 1 to 50, lower numbers indicating that a judge’s individual rankings are closer to the overall panel rankings. When there has been a second FPS iteration in accordance with rule 8.6.5, the RI is calculated using only data from the second iteration, i.e. pilots excluded from the second iteration are also excluded from the RI calculation.

8.8.2. Low and High Scoring Anomalies

8.8.2.1. A Low or High Scoring Anomaly is determined to have occurred each time a judge grades a figure significantly lower or higher than the consensus view of the judges.

8.8.2.2. For each figure, examine the normalised scores. If a judge’s score for the figure has been determined ‘Low’ or ‘High’ at the approved confidence level, then add one to that judge’s aggregate of errors under the appropriate heading.

8.8.3. Discrimination

8.8.3.1. Judges show differing degrees of “Discrimination” in that they score over wider or narrower ranges of raw grades. The FPS will keep track of these raw grades for subsequent publication and analysis in the form of histograms and banded totals.

8.8.4. Hard Zero Anomalies

8.8.4.1. The occurrence of Hard Zeros is determined by majority voting or by video conference. The scoring system determines the validity of each HZ from the “CHZ” box on the score sheets.

8.8.4.2. In the event that an individual judge fails to identify a confirmed Hard Zero, then add one to that judge’s aggregate of errors under this heading. Similarly, if a judge gives a grade of HZ when no such error occurred, add one to the aggregate of errors under this heading.

8.8.5. Sequence Score Anomalies

8.8.5.1. A Sequence Anomaly occurs whenever a judge grades a whole sequence significantly higher or lower than the consensus view of the judges.

8.8.5.2. For each pilot, examine the normalised sequence scores. If a judge's score for the sequence has been determined 'High' or 'Low' at the approved confidence level, then add one to that judge's aggregate of errors under this heading.

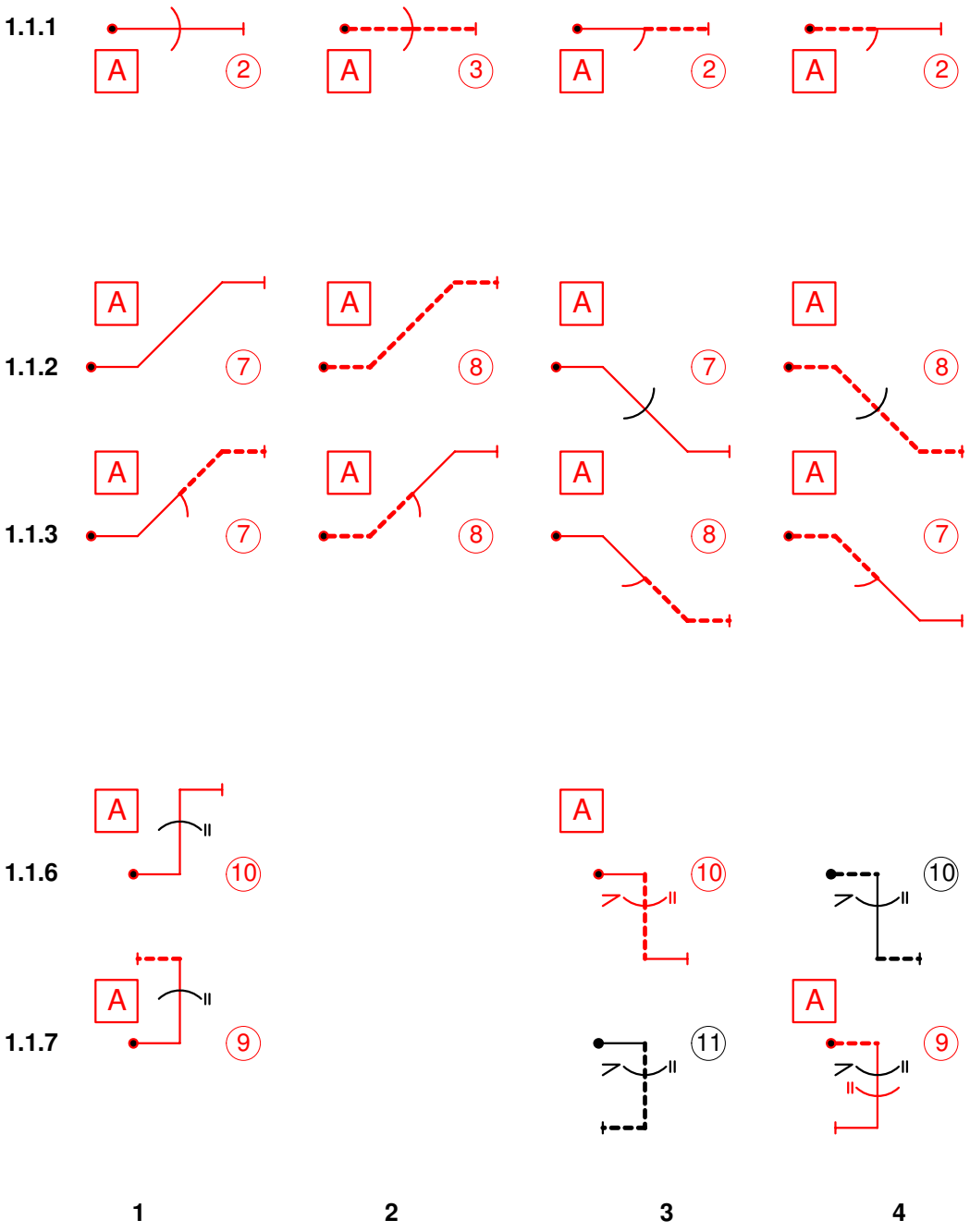
9. LIST OF FIGURES FOR PROGRAMMES 3 THROUGH 6

9.1. Figures approved by CIVA for the composition of Unknown Programmes

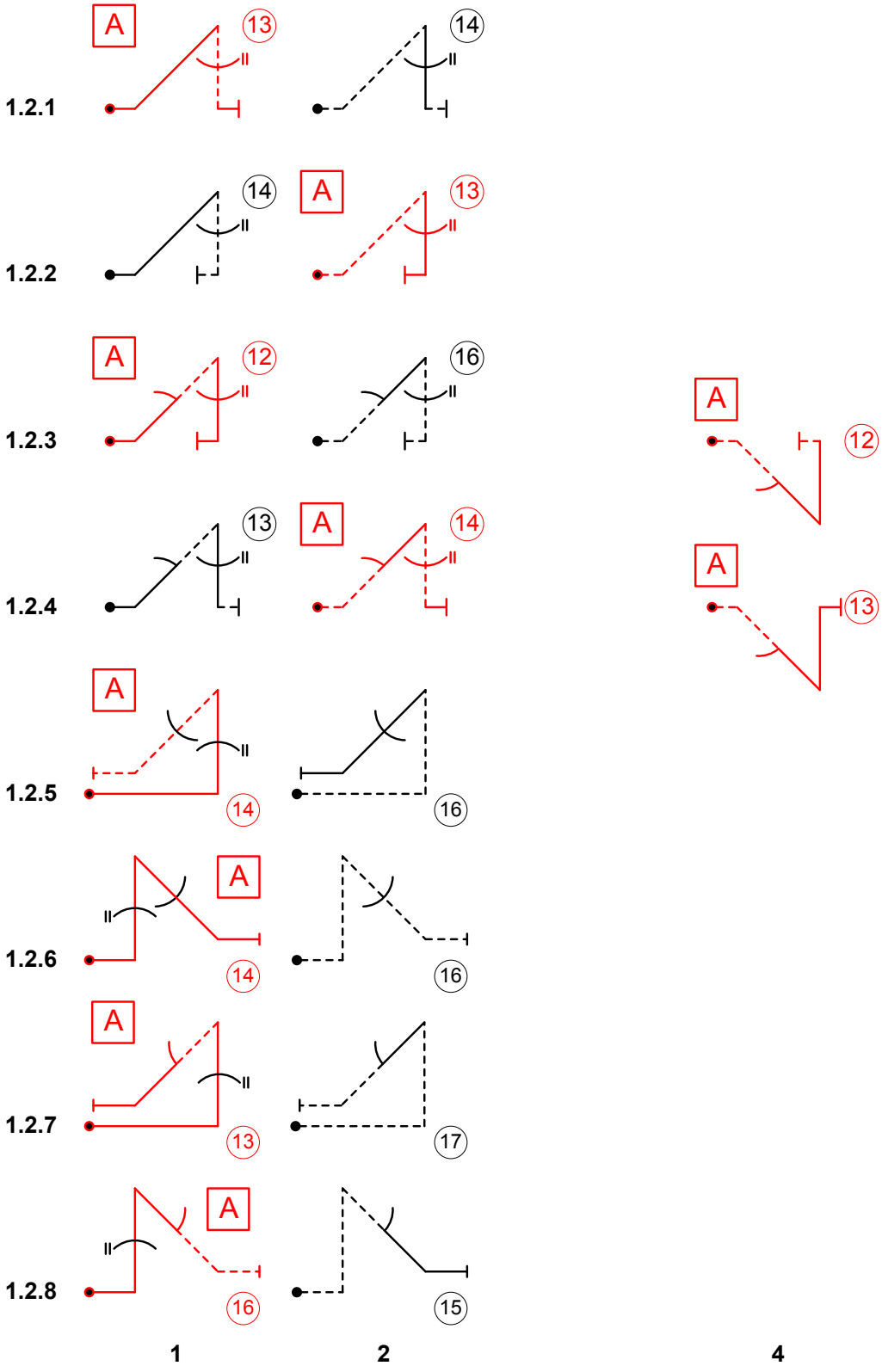
9.1.1.1. Figures or elements shown in red and annotated with [A] are allowed in Advanced Glider contests.

9.1.1.2. Opposite slow or hesitation rolls are allowed on horizontal lines only.

Family 1.1.1 to 1.1.7

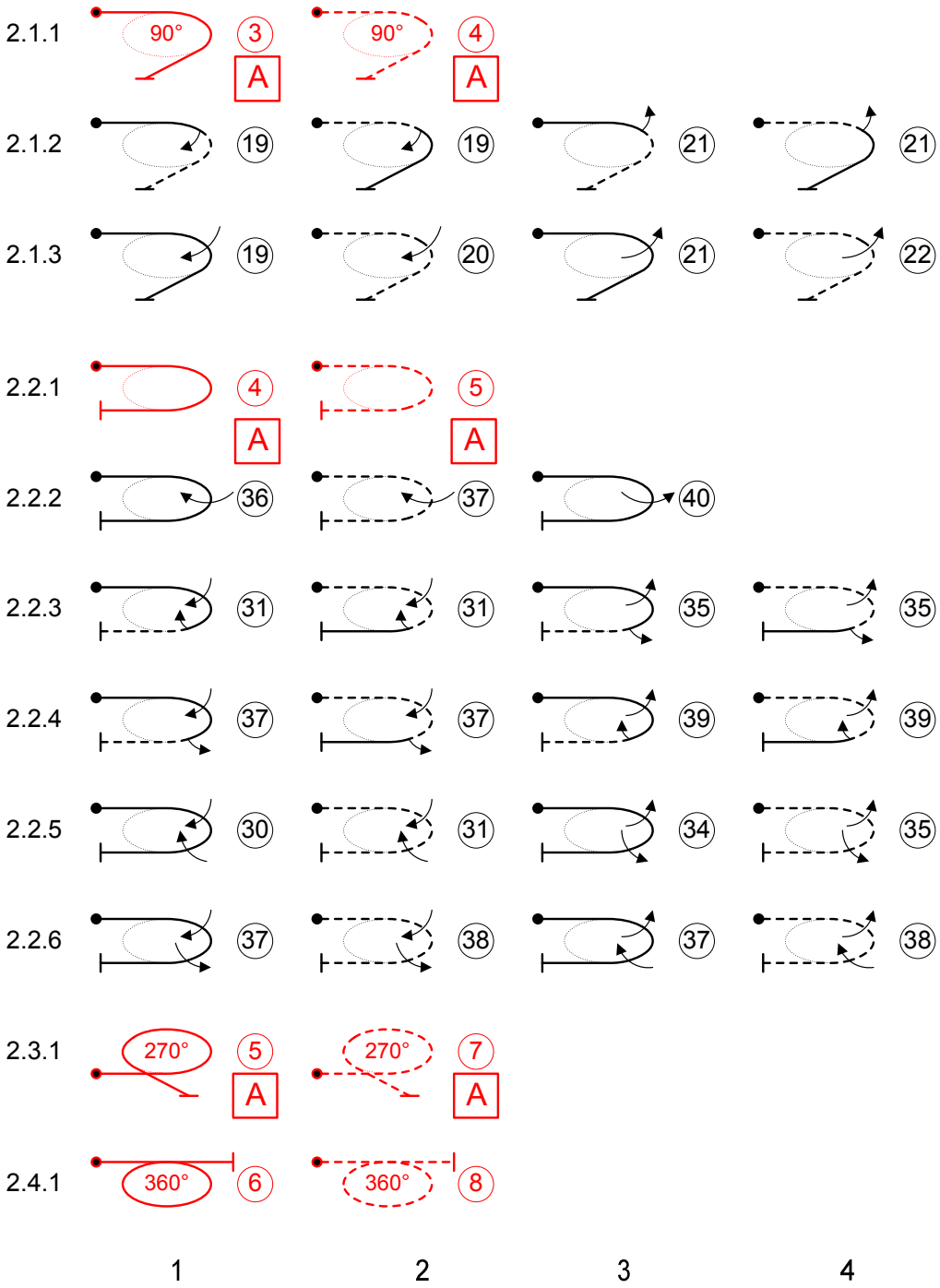


Family 1.2.1 to 1.2.8

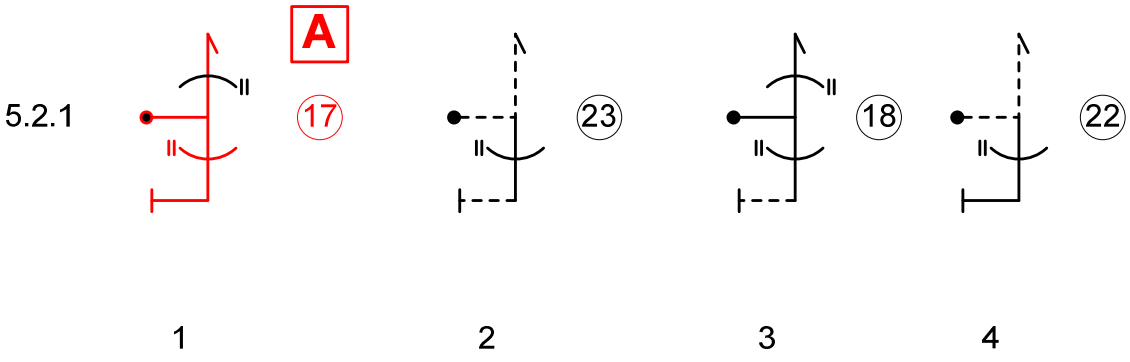


9.1.1.3. No vertical rolls in figures of column 4 and column 2 of lines 1.2.5 to 1.2.8.

Families 2.1.1 to 2.4.1, Turns and Rolling Turns

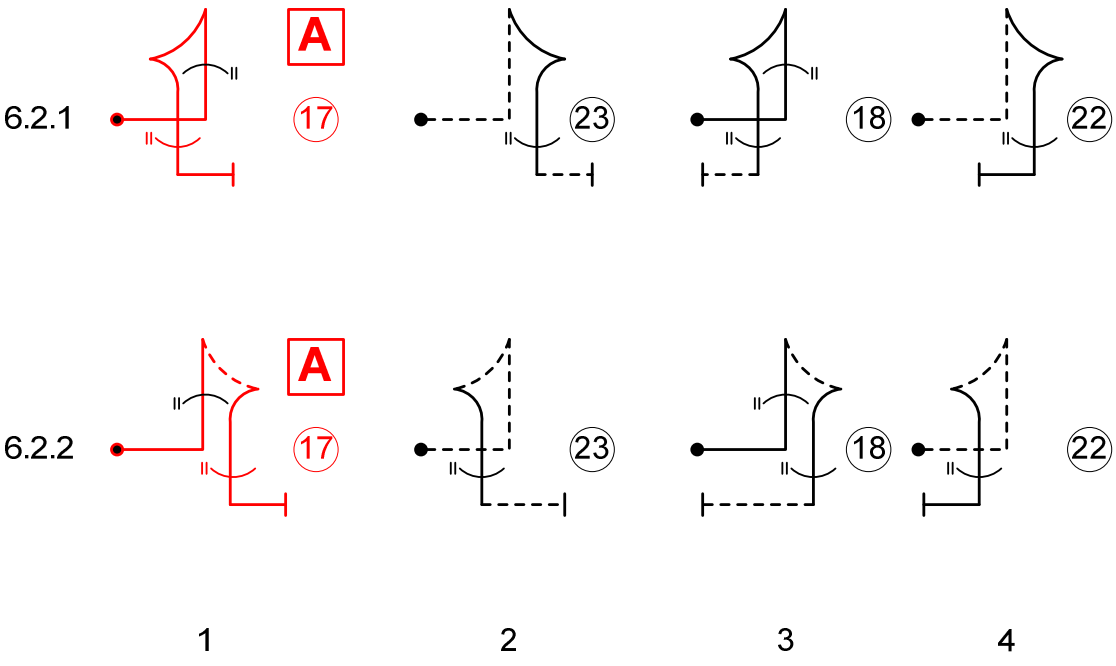


Family 5.2.1 Stall Turns



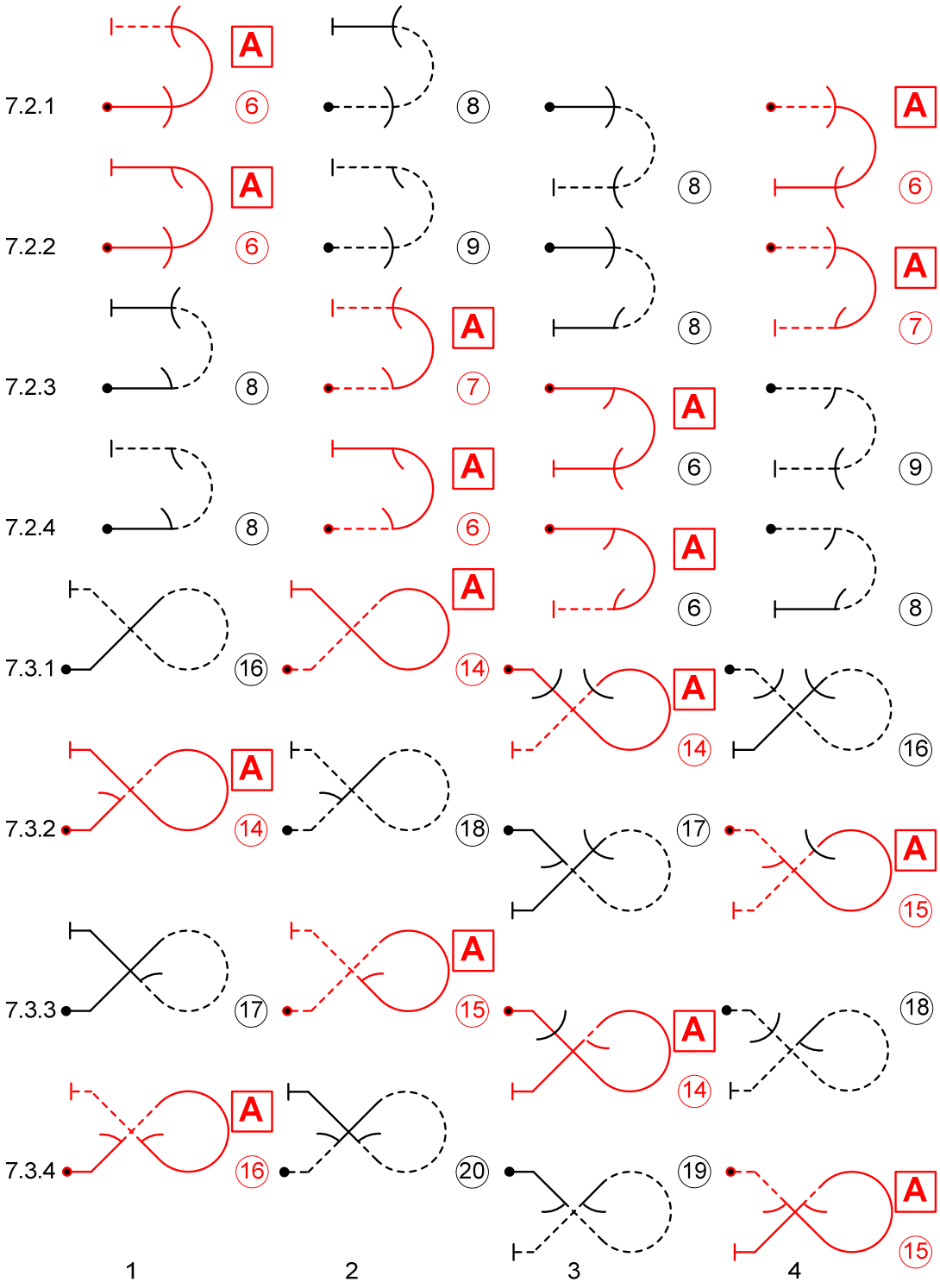
9.1.1.4. Rolling elements may only be added where indicated.

Family 6.2.1 and 6.2.2, Tail Slides



9.1.1.5. Rolling elements may only be added where indicated.

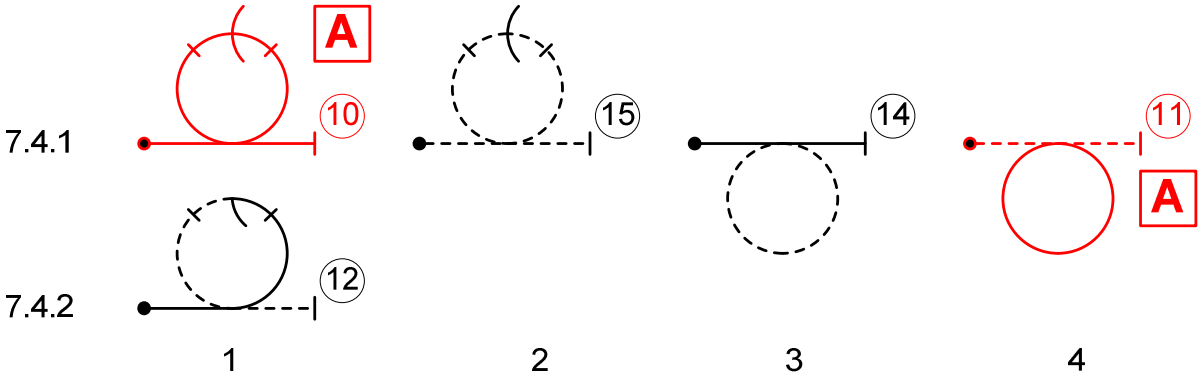
Families 7.2.1 to 7.3.4



9.1.1.6. No flick rolls on the horizontal entry lines of figures in columns 1 and 2, nor on the horizontal exit lines of figures in columns 3 and 4 of 7.2.1 to 7.2.4.

9.1.1.7. No negative half flick rolls on 7.2.2.2 or 7.2.4.1.
No positive half flick rolls on 7.2.2.1 or 7.2.4.2.

Family 7.4.1 and 7.4.2, Full Loops

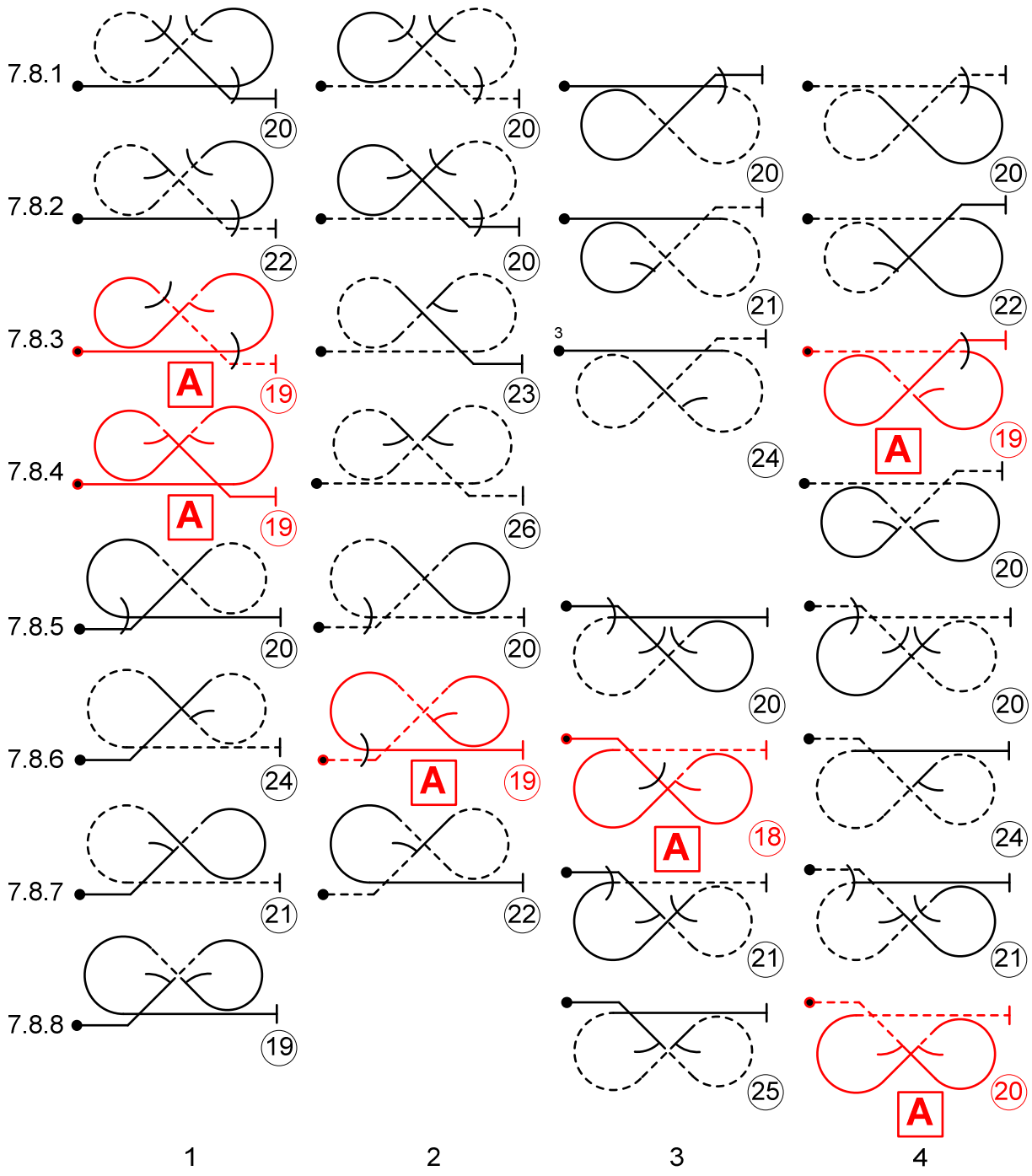


9.1.1.8. No rolls on figures 7.4.1.3 and 7.4.1.4.

9.1.1.9. No superslow rolls in the top of figures 7.4.1.1, 7.4.1.2 and 7.4.2.1.

9.1.1.10. No hesitation rolls in the top of figure 7.4.1.2.

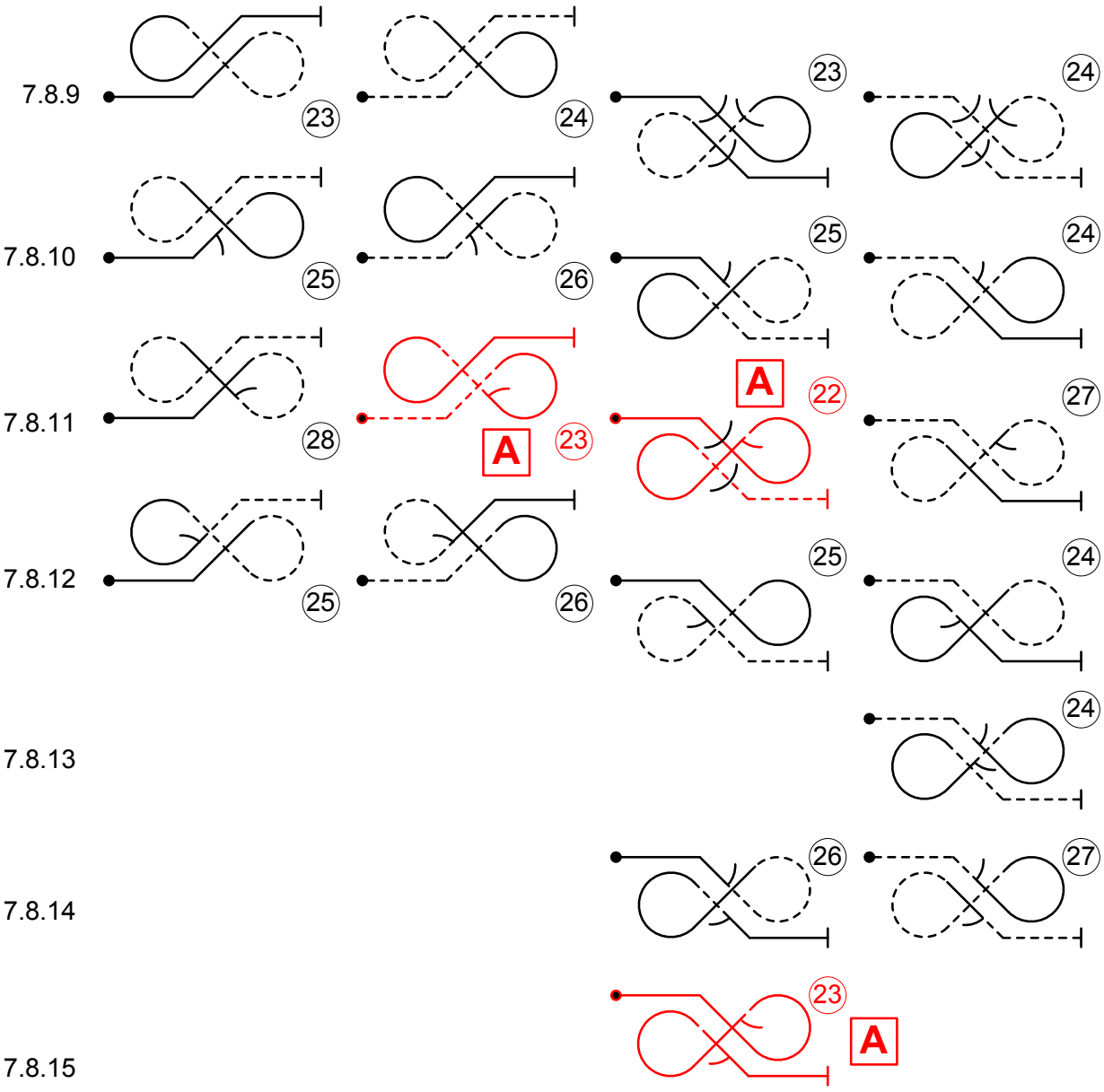
Family 7.8.1 to 7.8.8



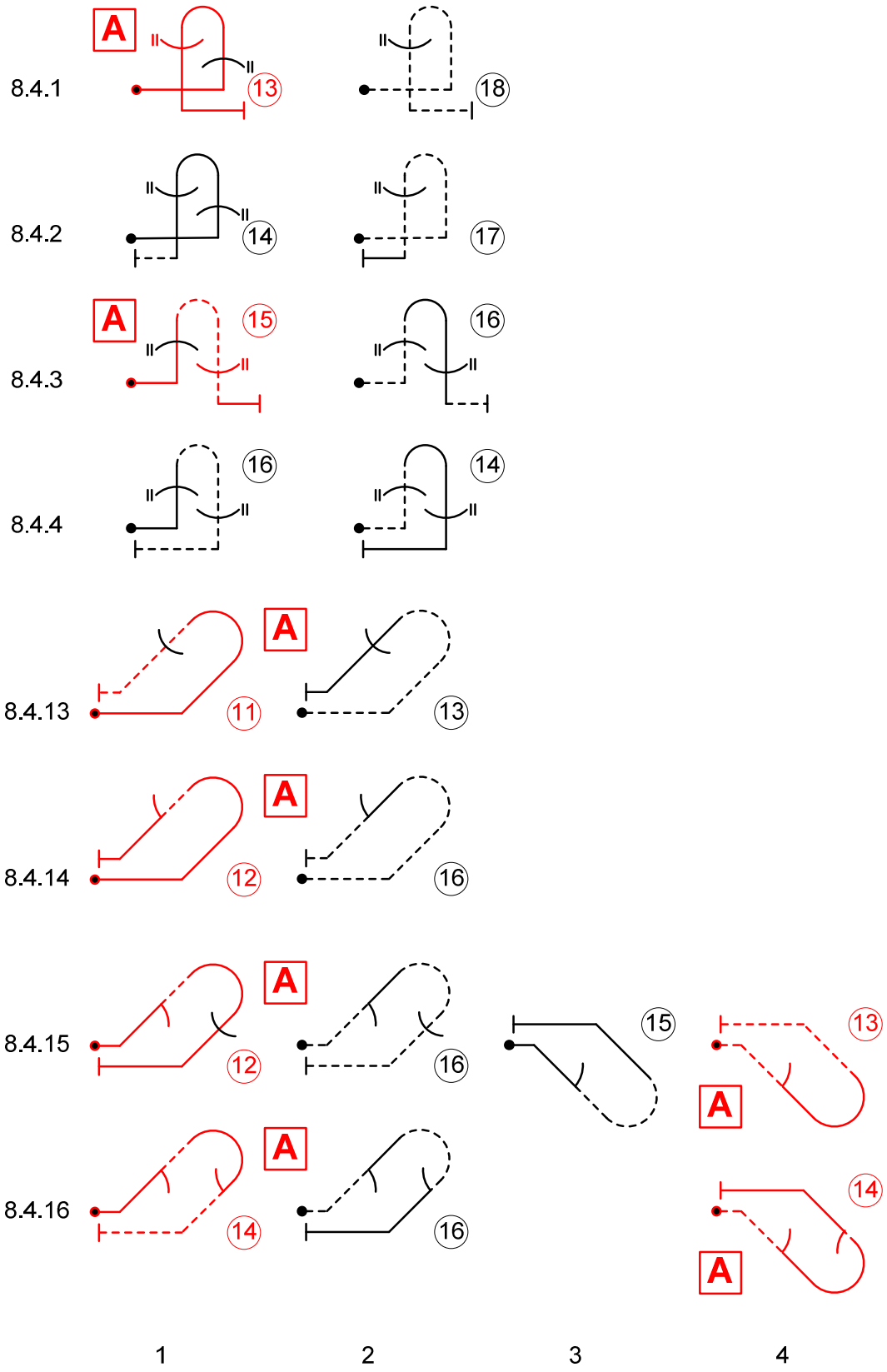
9.1.1.11. No flick rolls on the horizontal entry lines of figures in columns 1 and 2 of 7.8.1 to 7.8.4.

9.1.1.12. No flick rolls on the horizontal exit lines of figures in columns 1 and 2 of 7.8.5to 7.8.8.

Family 7.8.9 to 7.8.15

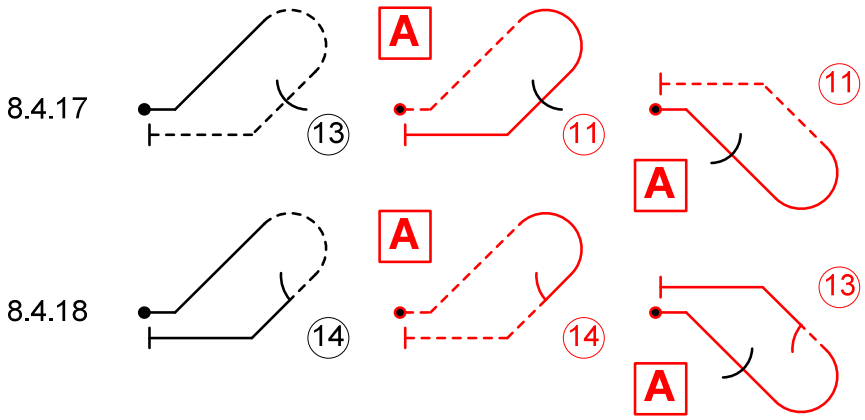


Family 8.4.1 to 8.4.16



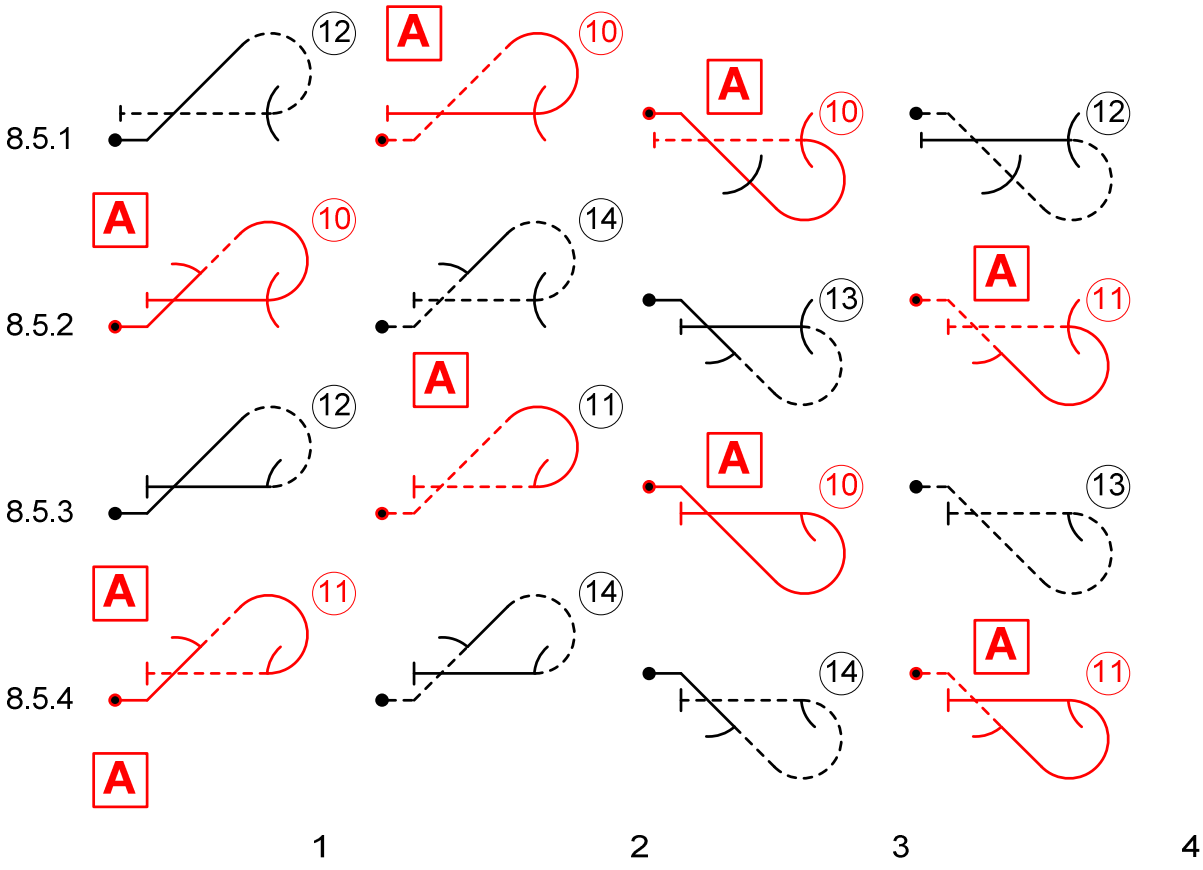
9.1.1.13. No rolls on the vertical uplines of 8.4.1.2 and 8.4.2.2.

Family 8.4.17 and 8.4.18



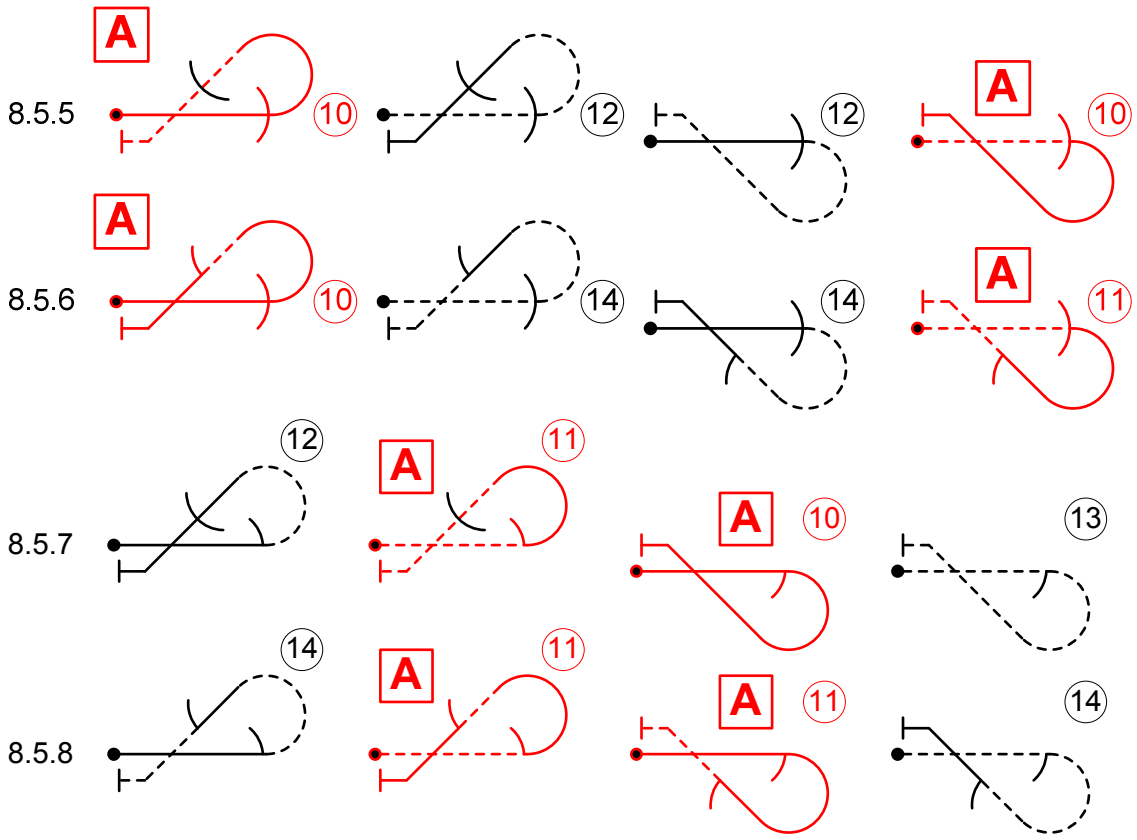
9.1.1.14. No flick rolls on the down lines of figures 8.4.15.2, 8.4.16.2, 8.4.17.1 and 8.4.18.1.

Family 8.5.1 to 8.5.4



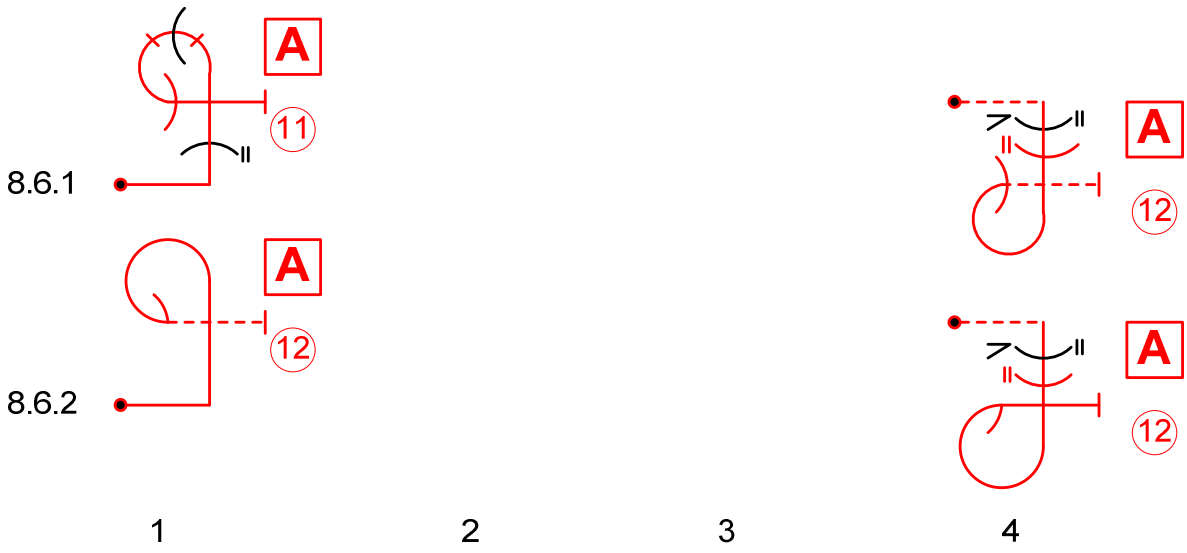
9.1.1.15. No flick rolls on the horizontal exit lines of figures in columns 1 and 2 on this page.

Family 8.5.5 to 8.5.8



9.1.1.16. No flick rolls on the horizontal entry lines of figures in columns 1 and 2 on this page.

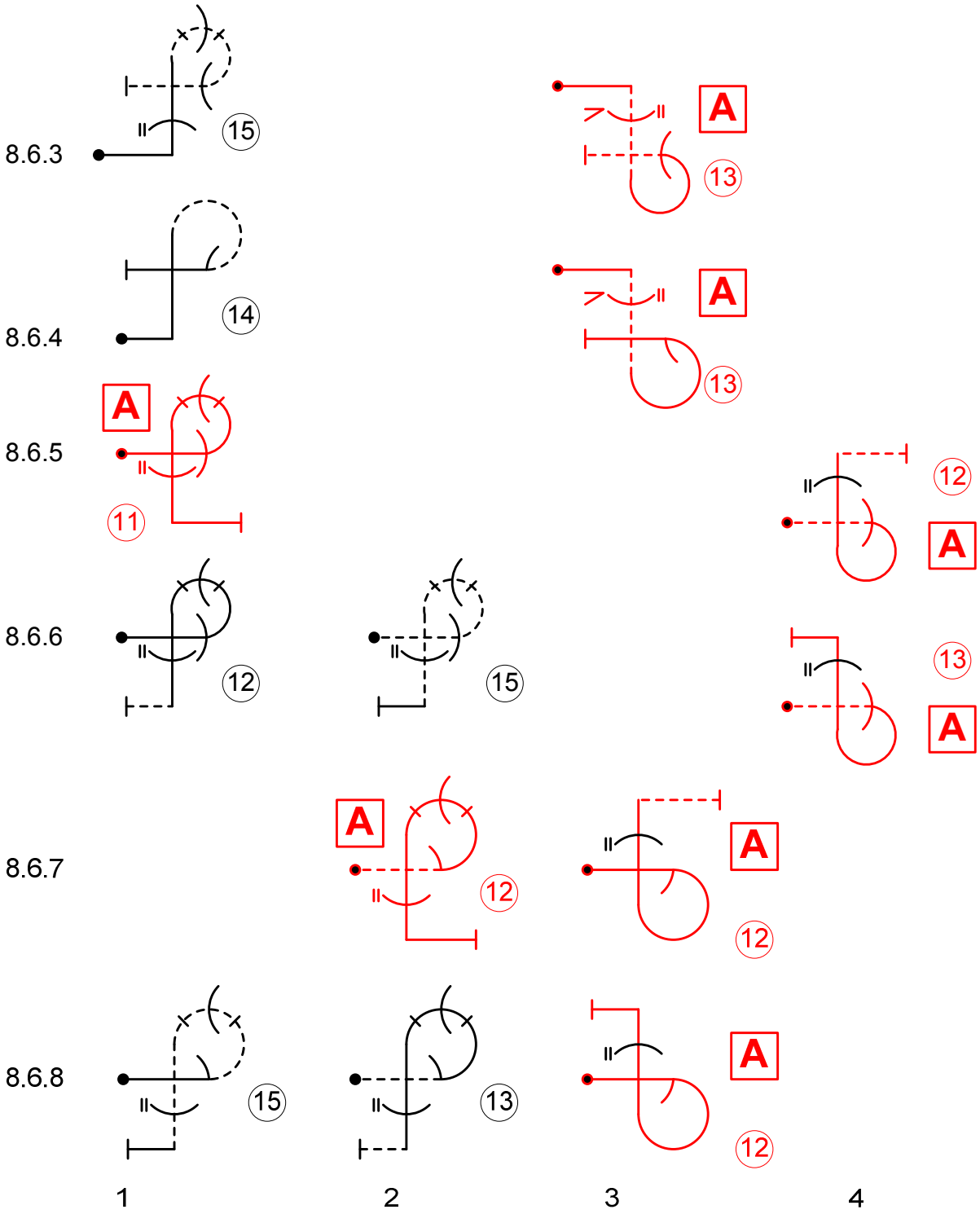
Family 8.6.1 and 8.6.2



9.1.1.17. No superslow rolls in the top of figure 8.6.1.1.

9.1.1.18. No rolls on top of figures 8.6.1.1 or 8.6.3.1 after a roll on the up line.

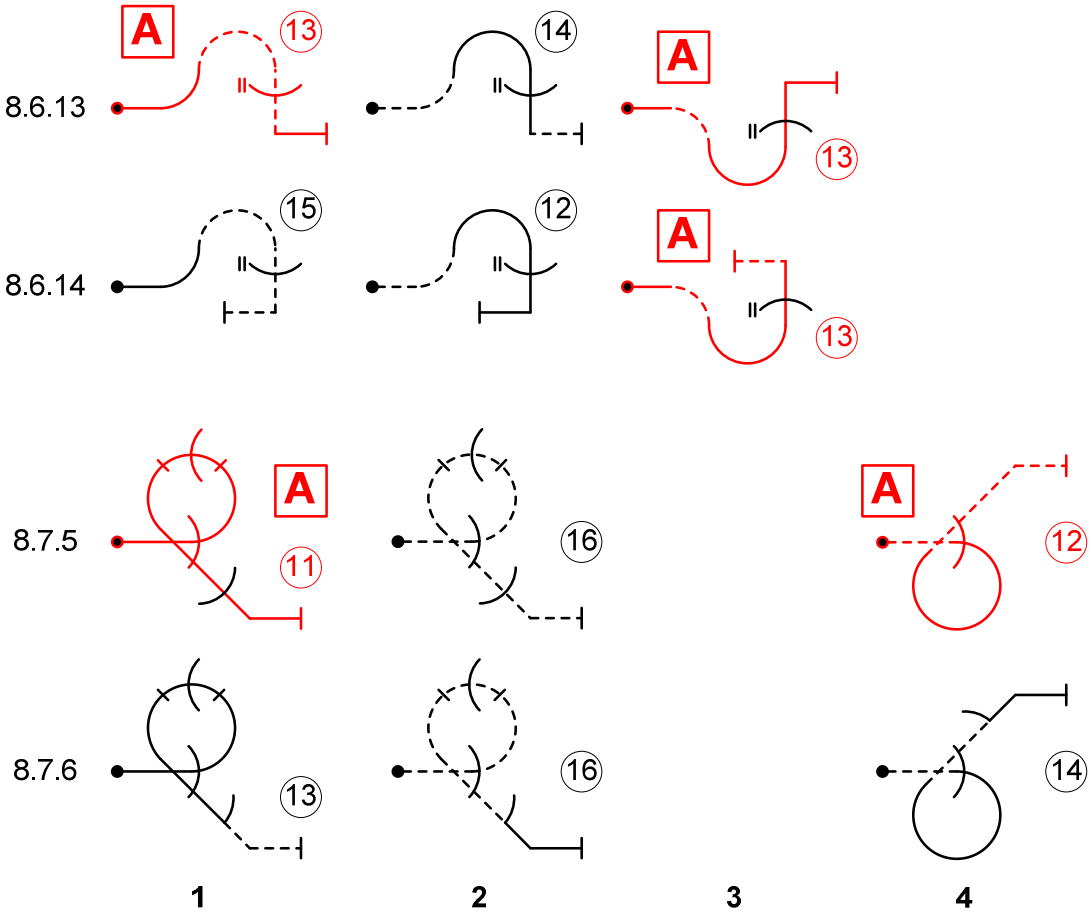
Family 8.6.3 to 8.6.8



9.1.1.19. No superslow rolls in the top of figures in columns 1 and 2 of 8.6.3 through 8.6.8.

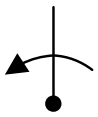
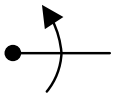
9.1.1.20. No flick rolls on vertical down lines of columns 1 and 2 of 8.6.5 to 8.6.8 after a hesitation roll in the loop.

Families 8.6.13, 8.6.14, 8.7.5 and 8.7.6

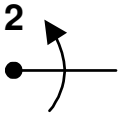


9.1.1.21. No hesitation rolls on top of figures 8.7.5.2 and 8.7.6.2.

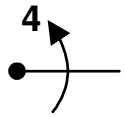
Family 9.1, Aileron Rolls

9.1		¼	½	¾	1	1¼	1½	1¾	2
1		9							
2			9 A						
3			6 A		12 A		15 A		18 A
4			6 A		12				
5		3 A	6						
		1	2	3	4	5	6	7	8

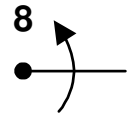
Family 9.2, 2-Point Rolls

9.2					1		1½		2
3					14 A				
		1	2	3	4	5	6	7	8

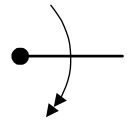
Family 9.4, 4-Point Rolls

9.4			½	¾	1	1¼	1½	1¾	2
2			11 A						
3			8 A		17 A				
4			8 A						
		1	2	3	4	5	6	7	8

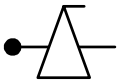
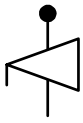
Family 9.8, 8-Point Rolls

9.8		¼	½	¾	1	1¼	1½	1¾	2
3			11 A						
		1	2	3	4	5	6	7	8

Family 9.13, Super-Slow Rolls

9.13			½		1		1½		2
3			8 A		16 A				
		1	2	3	4	5	6	7	8

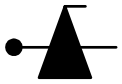
Family 9.9, Positive Flick Rolls

9.9			½	¾	1	1¼	1½	1¾	2
2			15						
3			12		16				
4			12		16				
5			12	14	16				
8			15						
10			12	14	16				
		1	2	3	4	5	6	7	8

9.1.1.22. Full horizontal positive flick 9.9.3.4 only at the apex of upward looping figures.

9.1.1.23. Positive half flick on negative line 9.9.8.2 only with catalogue numbers 7.2.2.2 and 7.2.4.1.

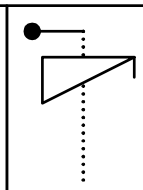
Family 9.10, Negative Flick Rolls

9.10			½	¾	1	1¼	1½	1¾	2
2			18						
3			15						
4			15		19				
5			15	17	19				
8			18						
10			15	17	19				
		1	2	3	4	5	6	7	8

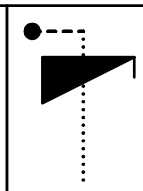
9.1.1.24. No inverted exit after more than 1/2 negative flick vertically down.

9.1.1.25. Negative half flick on positive line 9.10.8.2 only with catalogue numbers 7.2.2.1 and 7.2.4.2.

Family 9.11, Positive Spins

				1	1¼	1½	1¾	2
1		Upright Entry Line		5 A	6 A	7 A		
				4	5	6	7	8

Family 9.12, Negative Spins

				1	1¼	1½	1¾	2
1		Inverted Entry Line		7	8	9		
				4	5	6	7	8

10. RULES FOR THE USE OF ELECTRONIC HEIGHT MEASURING DEVICES (HMDs)

10.1. Types of HMDs

10.1.1.1. There are currently three types of Height Measuring Devices approved by CIVA.

a) The Huber Height Measuring Device (HHMD)

b) The Meierhofer Height Measuring Device (MHMD)

c) The Poznan Height Measuring Device (PHMD)

10.2. Functions of HMDs

10.2.1. Overview

10.2.1.1. An onboard transmitter sends signals to the ground receiving equipment (at the Chief Judge's position) when the glider descends below the upper or lower height limits or the disqualification height. The ground equipment indicates the height and the identification of the transmitter on a display and emits an audio signal ("beep") whenever signals from one of the onboard transmitters are received.

10.2.1.2. MHMD

a) If a PC is connected to the ground receiver, the actual height above ground will be indicated in real time. The received height data can also be recorded for later analysis.

b) All height limits can be set individually whenever this becomes necessary due to terrain or other reasons.

10.2.1.3. In case of the HHMD, the onboard transmitters must be re-programmed, when non-standard height limits are to be used.

10.2.1.4. The HMD transmitter in the glider cockpit provides the following audio signals to the pilot:

a) Functional checks at 100/200 m during tow (one "beep" each),

b) Continuous signal ("beep-beep-beep") as long as the glider flies above the upper height limit,

c) Descent below the upper height limit is indicated by the stop of the continuous signal,

d) Descending below 200 m: one "beep" (HHMD),

e) Descending below 100 m: one "beep" (HHMD),

f) Descending below 200 m until reaching 100 m: continuous signal "beep-beep-beep" (MHMD and PHMD).

10.2.1.5. If the glider climbs back above the respective height, the signal will be repeated every time it descends below that height again.

10.3. Technical Characteristics

10.3.1. Tolerances

10.3.1.1. The onboard transmitter will always send its signals according to the pre-programmed height limits. In the case of the HHMD, small tolerances are preset when programming the transmitters. This ensures that the signal for the upper height limit will be transmitted at an actual height slightly above the limit, whilst the signals for the lower limit and the

disqualification height are transmitted slightly below the exact height. With the MHMD and PHMD discrete tolerances can be selected for each height limit. The Chief Judge decides which tolerances will be set when programming the airborne transmitters.

10.3.1.2. The guaranteed overall tolerance of the HMD systems is considerably smaller than the tolerances of the conventional altimeters used in gliders. Pilots must further understand that unlike mechanical altimeters, the electronic pressure sensor in the HMD is not influenced by rate of descent or climb. This means that whilst the mechanical altimeter displays a significant lag during rapid changes of altitude (always indicating low in a climb and high in a descent), the HMD will transmit its signal exactly at the pre-set height. Under certain conditions, however, there may be a short delay of typically 2-3 sec. before the ground equipment receives the signal due to the technical limitations of the data link system used.

10.4. Operating the HMDs

10.4.1.1. Whenever an HMD is in use, it will be the primary reference for the Chief Judge to verify compliance with height limits and for decisions on penalties or disqualifications due to height infringements. HMD audio signals are recorded together with the video.

10.4.1.2. A person assigned to the Chief Judge will monitor the HMD ground equipment and log every flight on a specific form to keep track of proper functioning of the device and record height infringements. When the MHMD or PHMD is in use, a computer should always be connected to the ground receiver in order to record the height data of all flights.

10.4.1.3. Calibration, installation, setting up, checking, and removal of the HMD onboard transmitters will be performed by members of the Technical Commission or persons specifically designated for this duty.

10.4.1.4. All participating gliders must have a mounting bracket for the onboard transmitter as specified in this Section. The pilot is responsible that the HMD transmitter is securely mounted inside the glider. Should the transmitter come loose during the flight due to improper mounting, this will not be accepted as a valid technical failure and a re-flight will not be allowed.

10.4.1.5. The towing height with HMD is always at least 50 m higher to ensure proper functioning of the HMD.

10.5. Malfunction or Failure of the HMD

10.5.1.1. Whenever a competitor notices or assumes a malfunction of the HMD (e.g. the audio signal does not stop below 1200 m), they may return for landing without starting the programme. After starting the programme, there is no justification for breaking off due to an assumed malfunction of the HMD.

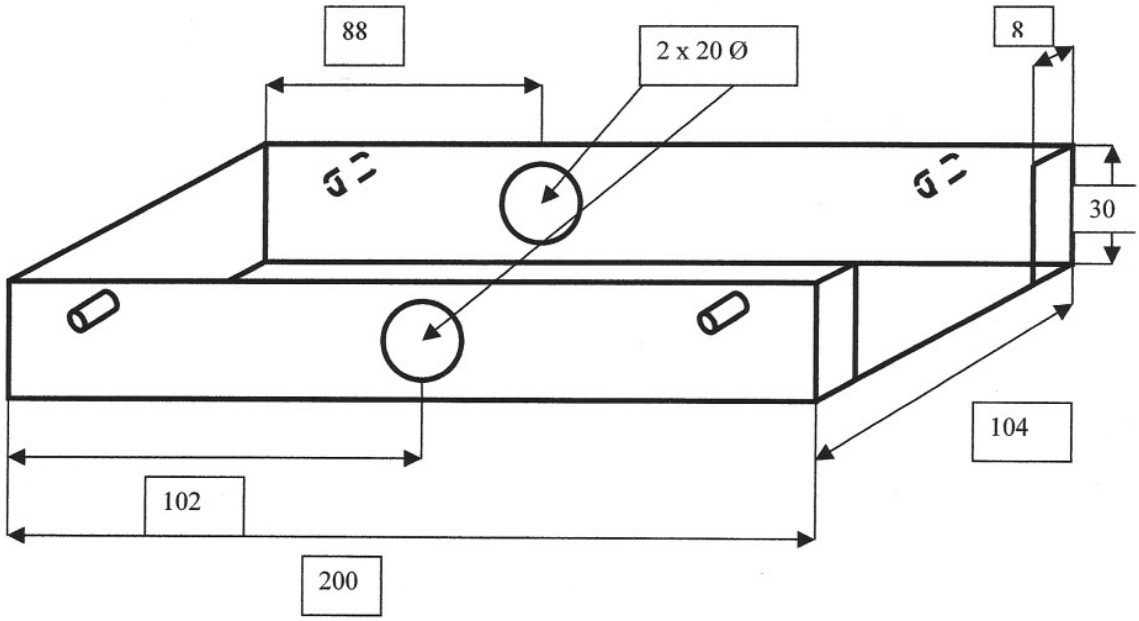
10.5.1.2. A failure of the link between the HMD and the official video recording equipment has no influence on the validity of the HMD measurements, as long as the normal functions of the HMD, as described above, are not degraded.

10.5.1.3. If the HMD system becomes unserviceable during the contest, procedures for towing and determining infringements of height limits for subsequent flights will be in accordance with the rules laid down in paragraph 4.2.4.4.

10.5.1.4.

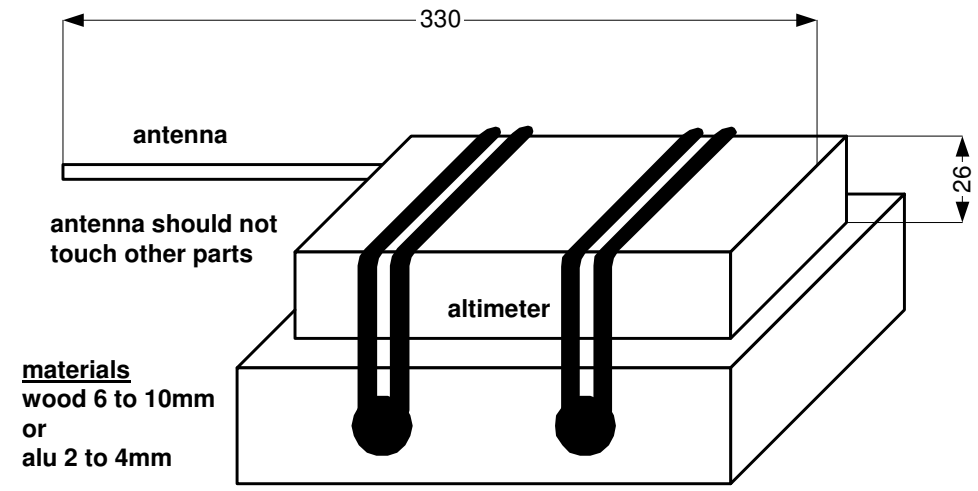
10.6. Mounting Brackets

10.6.1. MHMD



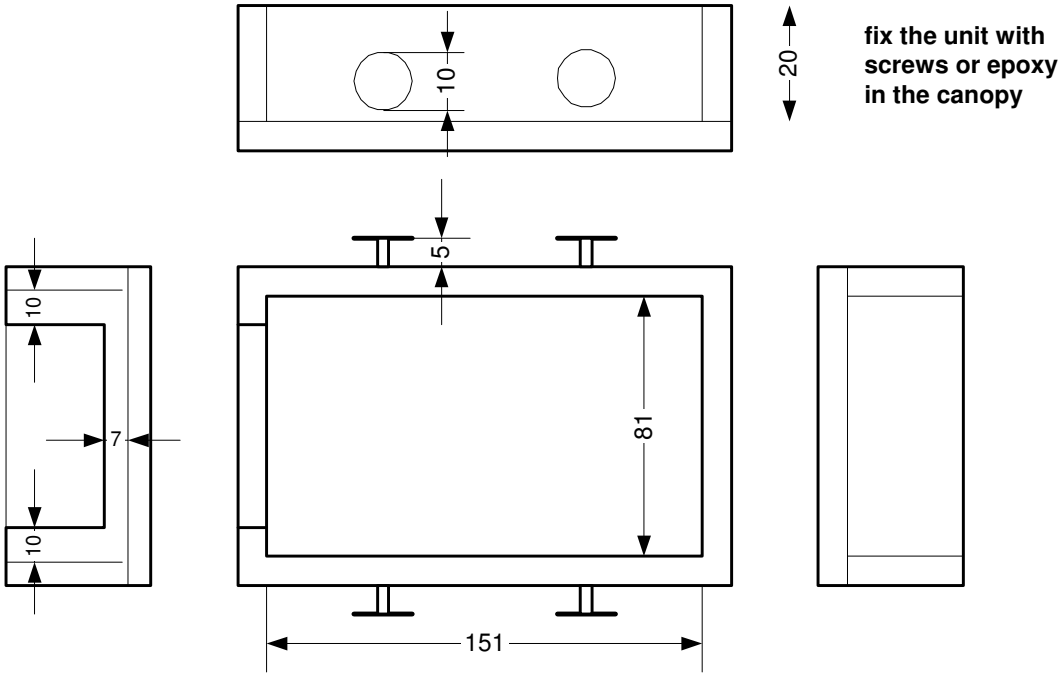
10.6.1.1. All dimensions are interior measurements in millimetres. The HMD transmitter should be fixed in the mounting by two rubber bands of sufficient strength. Dimensions of the MHMD transmitter are 195 x 100 x 40 mm. Mass is 535 g including batteries and antenna.

10.6.2. HHMD



altimeter mounting unit

dimensions: mm



For any questions: **e-mail: spc-hupe@eunet.at**
call or fax to PETER HUBER **fax: +43-7724-60784**

Remarks:

10.6.2.1. Any mounting should be strong enough and attached securely enough to withstand the g-forces likely to be encountered during aerobatics.

10.6.2.2. It is the pilot's responsibility to ensure that the HMD transmitter is securely mounted in the glider.

11. KNOWN COMPULSORY PROGRAMMES

11.1. Unlimited Known Programme

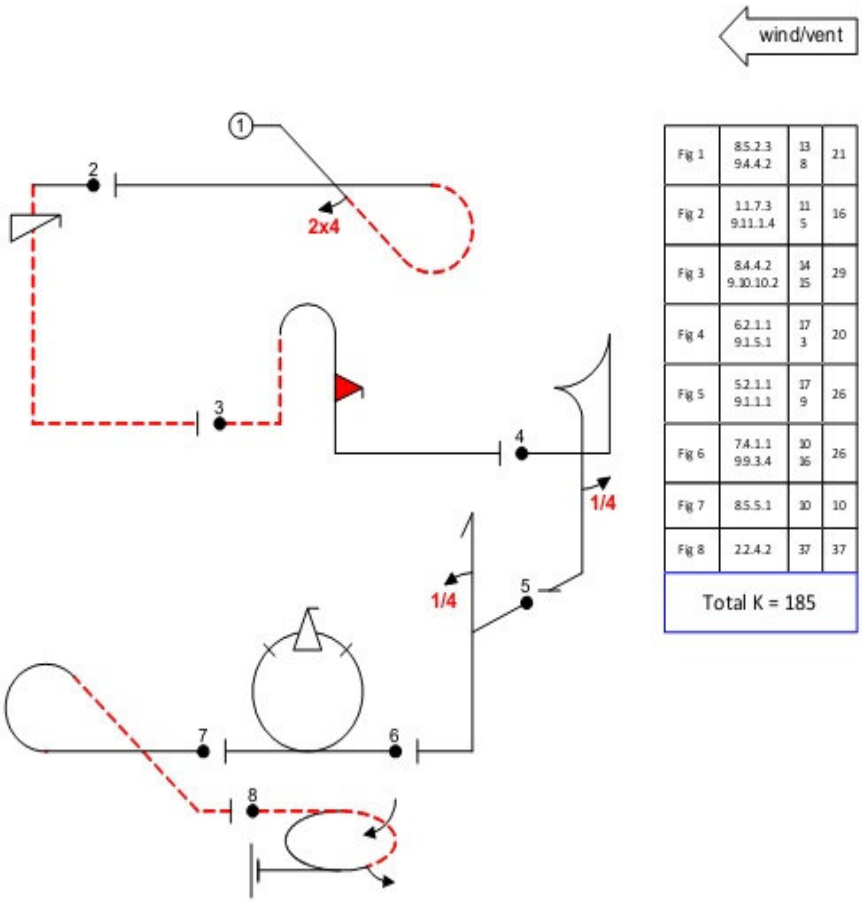


Fig 1	8.5.2.3 9.4.4.2	13 8	21
Fig 2	1.1.7.3 9.11.1.4	11 5	16
Fig 3	8.4.4.2 9.10.10.2	14 15	29
Fig 4	6.2.1.1 9.1.5.1	17 3	20
Fig 5	5.2.1.1 9.1.1.1	17 9	26
Fig 6	7.4.1.1 9.9.3.4	10 16	26
Fig 7	8.5.5.1	10	10
Fig 8	2.2.4.2	37	37
Total K = 185			

11.2. Advanced Known Programme

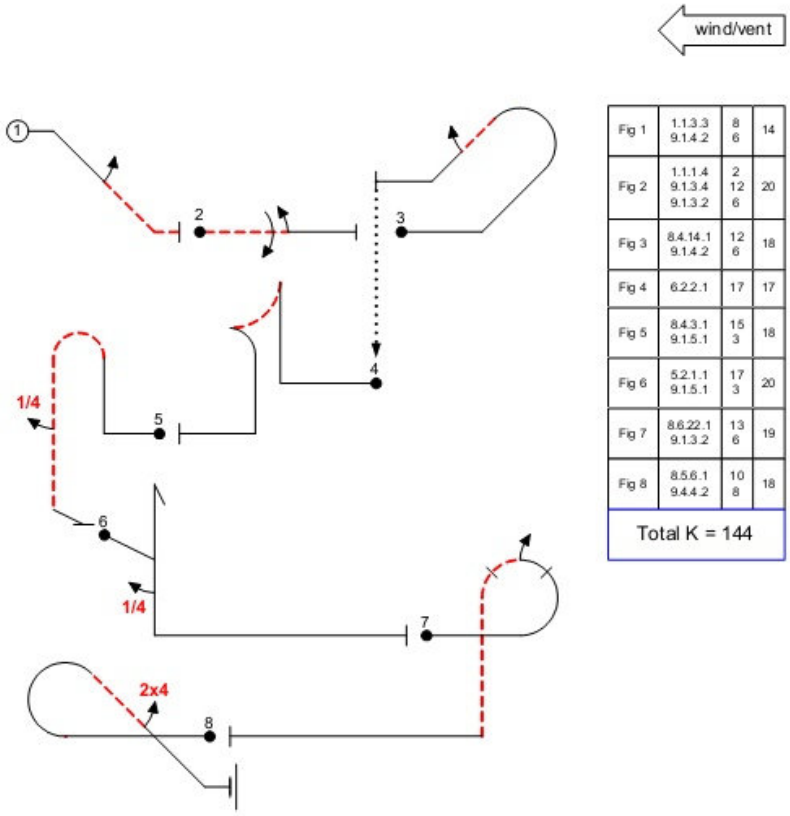


Fig 1	1.1.3.3 9.1.4.2	8 6	14
Fig 2	1.1.1.4 9.1.3.4 9.1.3.2	2 12 6	20
Fig 3	8.4.14.1 9.1.4.2	12 6	18
Fig 4	6.2.2.1	17	17
Fig 5	8.4.3.1 9.1.5.1	15 3	18
Fig 6	5.2.1.1 9.1.5.1	17 3	20
Fig 7	8.6.22.1 9.1.3.2	13 6	19
Fig 8	8.5.6.1 9.4.4.2	10 8	18
Total K = 144			

12. RECORD OF AMENDMENTS

Version Number	Date Issued
2006-1	1 February 2006
2007-1	1 January 2007
2008-1	1 March 2008
2008-2	1 May 2008
2009-1	1 January 2009
2010-1	1 February 2010
2011-1	1 February 2011
2012-1	15 February 2012
2013-1	15 February 2013
2014-1	1 January 2014