FEDERATION AERONAUTIQUE INTERNATIONALE
INTERNATIONAL AEROMODELLING COMMISSION (CIAM)
Space Models Subcommittee

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" S A P P H I R E "

A PROPOSAL OF THE SPACEMODELLING DEVELOPMENT PROGRAM FOR THE NEXT DECADE

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Foreword[2]

Spacemodelling (SM), established 40 years ago by G. Harry Stine, as an attractive, instructive and achievable equivalent of astronautics and rocketry for youngsters, has developed into a very popular widespread air sportin over 25 countries at three continets with thousands of modellers. Eleven World and four Continental Championships, tens of OpInts and other regional international competitions were organized over last 25 years. The last one held in Slovenia (1996) had almost 300 competitors from 22 countries.

SM, however, is still not well known to a broad audience and to media – and also in not allowed in some countries, yet. Also, in most of the competitions only the "traditional" classes (S3, S4, S6, S7and S8) are flown, but many other are set aside (S1, S2, S9, S10).

The present situation requires a new development program to push SM forward again and to give stimulus for inventions and competitions for thousands of newcoming spacemodellers. Follows a proposal of the "SAPPHIRE" Space Models Development Program (an acronym for ***S****afe and* ***A****ttractive* ***P****ublic* ***P****romotion of* ***H****igh-Tech* ***I****nventions for (Model)* ***R****ocketry[3] (SM)* ***E****nchancement.* Here are some topics of the program, which require further elaboration. Some of these ideas and proposals should be later converted into the Sporting Code rules and guides.

1. Safe

Space models must be essencially *safe*. Their penetrenability must be low, which assumes a specified and limited balistic coeficient (Wt/CdA)[4]. Three groups of SM classes are clearly noticeable[5]: 1) *Altitude* (S1, S2), 2)

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[1] CIAM Bureau appointed S. Pelagic an Acting Chairman of Space Models Subcommittee on 6th December, 1996 and the CIAM Plenary Meeting elected him a CIAM Space Models SC Chairman in March, 1997. This was his inaugural program for SM SC development activities.

[2] Comments in footnotes show to what extent is the "SAPPHIRE" SM SP realized so far.

[3] "Model Rocketry" was the original term for our activity, which was replaced with "Space Modelling" because of contstant problems with custom officers at border crossings, because the term "rocket" reminded them to missiles and they considered them unsafe.

[4] Wt – total weight, Cd – drag coeficient and A-maximum body cross section.

[5] There are noticeable five groups of classes today: 1) Altitude – S1, S2 2) Rocket duration: S3, S6, S9 3) Free-flight boost gliders: S4, S10 4) RC rocket gliders: S8 BS 5) Scale – S5, S7.

Duration (S3, S4, S6, S8, s9, S10) and 3) *Scale* (S5, S7).This shall allow modellers to enlarge dimensions of models (for example: overall length from 35 cm for A subclass to 100 cm for E & F classes) and to preserve safety. SM should take more care to motivate designers to develop and modellers to use very safe and cheap recovery devices for complete models or their parts and to publish technical reports on safety.

Engine testing must be carefully done and bulletins with their specifications should be published at World and Continental Championships.

SM SC should study organisation and safety experience of competitors from different countries and should develop a new safety code and procedures. In addition to the Safety Range Officer (RSO) there must be a few (1 to 5) Deputy RSO[6]s, who shall control particular segments of the launching site and coordinate launching with the RSO. This shall accelerate launching procedure. Also in future it would be necessary to nominate the FAI judges for all aforementioned groups of classes (in addition to now existing S5/S7 judges)[7] to have smooth, safe and high quality contests.

2. Attractive

Attractive to the public may be bigger models, painted in different bright colors and marked with easily visible markings. Sportsmen (modellers) should wear simple and not expensivembut attractive sportswear (which is a regular practice in other sports). We may promote special "spacemodellers' fashion". Launching sites must be properly equiped. It is necessary to set guides for for organisation of the contest sites for different levels of contests. PA (public address systems) must be a mandatory part of the field equipment to allow spectatiors to learn what happens in the field.[8]

Competitions must be more dynamic. So, altitude classes and scale classes may become more attractive if, at first, a period of 15-20 minutes shall be given for making models ready for launch and after that launchings come in burst serious (one by one separated for not more than 1 to 2 minutes)[9]. This practice exists in skying for years. Speakers should inform the audience about placings, who launches his model etc. Also, the organizers of the contests should be called to bring pupils from the schools and other youngsters to watch the contests. Small model shops may be provided in the field to give an opportunity to young people to buy their first kits an standing-by spacemodellers, who are not competing, may give the youngsters the first instructions.

Popularization of SM may be efficient if we launch small and safe space models in intermission of other sporting events (athletic events, horse races, football matches). S7 and S8E/P with improved flight (and recovery) characteristics may be launched during such events, too. Setting records may be linked to such events or it may become a practice in high-level competitions, when the organizers should reserve some time for setting records.[10]

3. Public Promotion

Inernet informations must be the most important source of informations on SM[11]. Sporting calendars, competition rules, organizer's guides, technical informations, informations to the media etc. should be on www. E-mail may be the most practical way to communicate to spacemodellers.[12]

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[6] This came in practice after 12th WSMCh in Romania in 1998.

[7] This was put in the rules in 2005 thanks to a help of D. Brown (USA), CIAM 2nd VP at that time.

[8] This was practice only in a few World Championships, recently in Baikonur 2006 with an excellent presentation of SM by Victor Rozhkov (RUS) in front of 3000 spectators.

[9] Preparation time and working time appeared in the rules when class S8E/P became a WCh class and in 2009 shall be applied also to the provisional class S6A/P.

[10] Shall appear in the FAI SC4 Vol SM – Edition 2009.

[11] There are two FAI SM lists for such informations for almost ten years. These are "Space Models SC List" ciam-smsc@fai.org only for SM SC members and «Space Models List" ciam-space@fai.org open to all subscribed space modellers. The first allow attachments to 4 MB, but the other shall transmit messages only up to 100 kB. It is a very successful practice for more than ten years. SM SC Chairman receives more than 2000 and send out more than 1500 e-mail messages every year recently.

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SM SC should make a cooperation program with Information and Education Subcommitte[13]. SM SC should prepare a monthly bulletin, which will be on Internet in different countries or to be sent occasionally to particular newspapers and magazines.[14] All NACs should cooperate with the local press assuring at least one journalist form each country to come to World and Continental Championships. CIAM may establish an international annual award for journalists. Also an International SM Education Program should be set to cover education of modellers and instructors devided at least to three levels. Special badges[15] may be given to the spacemodellers for remarkable, prescribed and specified in the rules results to encourage them for further achievements.

Summer and winter SM schools would be very attractive for young people. Such schools may take a week or two in a resort at the seacoast or in the mountains. So, making models may be combined with swimming or skying. Spain, Switzerland, France, Bulgaria and Yugoslavia[16] are good places for such activities.

4. High-Tech and Inventions[17]

Most of the development in SM is based on hobby work. Volunteers should be encouraged to do inventions by use of high-tech achievements in the folowing areas:

1. **Propulsion:** It is necessary to develop safe, efficiant, cheap space model engines resitant to moisture, temperature variations and which shall be useful safely after a very long period of time (five years or more).It must contain pirotechnic mixture, which provide an excelent visibility of the rocket on the whole trajectory. Technical solutions for safe clustering and staging are also required.

2. **Structure:** New, light, durable and not expensive materials should be applied. New kits with excellent flight characteristics are required for beginners.

3. **Balistics:** Practical and theoretical solutions for multistaged models must be given. Preserving predicted trajectory at multi-staging (without changing direction after stage separation) is of the greatest importance for altitude models. Computer programs for altitude prediction, for preliminary design etc are also required.

4. **Aerodynamics:** Some investigation must be conducted with new classes (S9, S10, S11/P) to get practical computer programs or graphs, which shall make easier design of such models. Aerodynamic improvement at traditional classes is also important. Very efficiant recovery Very efficient and reliable recovery systems must be especially investigated.

5. **Payloads:** Development of electronic, photographic or other payloads is very important to make classes S2 and S7 more interesting. Definition of a standard payload in S2 must be completely changed. It must turn from passive weight into an active, operating payload. Investigations on how to get light, cheap, safe and interference resistant onboard RC equipment shall be of major importance, too. This may be followed with the development of different telemetry equipment.

6. **Launchers:** Launchers must be small, efficiant and easy transportable with standardized connectors to igniting equipment. Igniters should be inserted and/or changed easily without taking model off the launcher (which causes waste of time and decreases reliability).

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[13] It was renamed several years ago to Education SC with Gerhard Woebbeking, CIAM 2nd VP as the Chairman.

[14] Instead of montly bulletins SM SC Chairman prepares Circular Letters, which are sent to SM SC members, SM SC competiton organizers, NACs etc. There are also several specialized papers, which reguraly cover our activities. Special examples are “CIAM Flyer” published electronically by CIAM and edited by E. Gizendanner (SUI) and “Interspace”, which S. Lodge (UK) publishes electronically for 10 years.

[15] This is a practice in gliding and parachuting for decades.

[16] Yugoslavia (YUG) does not exist from 2003, when has changed its name to Serbia and Montenegro (SCG). This country splited in 2006 to two separated countries Serbia (SRB) and Montenegro (MNE).

[17] There is a big difference in quality and quantity of commercially available computer programs, electronic equipment and other high-tech items in USA and Europe. Techology and now-how transfer from USA to Europe should be encouraged to ease realisation of these parts of SM Development Program.

7. **Ground equipment:** Practical score boards (possibly connected to computers), engine testing, thermal detection, signaling and paging equipment for judges and time-keepers, etc. should be developed. Cheap, portable engine testing equipment is of the greatest importance[18]. Some on board electronic equipment may make easier some data reduction in altitude classes. Most of the equipment should be standardized.

8. **Software:** Standard database should be developed and made available to the contest organizers. It is also necessary to have SW to support contest organization, scale judging, engine-testing etc.

5. Spacemodelling (Model Rocketry) Enhancement

All aforementioned activities shall contribute to SM enhancement. The major role, however, is expected to have World Cup Contests[19]. Placing points between three World Cup classes should be balanced[20]. So, it will be possible to get best and the most versatile spacemodeller in the world by adding points for all three classes[21]. World Cup contests can in that case turn to a "spacemodelling triatlon" similar to some classes in parachuting, skying etc.

The Sporting Calendar must be carefully set so to cover uniformly teritory of Europe and to give chance to spacemodellers to compete in all desired classes[22]. Each contest should include at least one new class at OpInt level (S2, S9, S10, S11/P).

RC models are very pomising and therefore new, more complex rules shuld be derived.

Spacemodellers from countries where SM is still not developed should be invited to their neighbouring countries to get experiences[23]. Some efforts should be made to get continental championships in Asia and America[24].

Conclusion

This paper gives a long list of proposals how to enhence spacemodelling activities. Some of our investigations show 2-3 countries a year can join to SM. Also in a country with 10 milion inhabitants a figure of 10.000 spacemodellers and 200 clubs can be achieved within 5 years[25].

Major importnce shall have good circulation of informations, good technical base and proper education of the young people. In addition to that SM is a very attractive and practical tool for technical education of youngsters.

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[18] "Zenite" from Ukraine produced the first cheap, digital, portable engine tester commercially available in Europe in 2002.

[19] Numbers of World Cup events increased from 9 in 5 countries in Europe in 1997 to 29 in 18 countries in Europe, Asia, America and Africa.

[20] The same formula for all World Cup classes in put in the rules from 2007. Number of World Cup classes is increased from three to five in 2001.

[21] The FAI SC4 Vol ABR rule B.2.6 defined International Ranking for all aeromodelling classes from 1998. Spacemodellers adopted this principle next year and in SC4 Vol ABR Annex 4 defined Space Models International Ranking. This is ranking similar to ATP and WTA lists in tennis, which takes into account all results from international events for every competitor. Such ranking was published in 1999 for the first time and three times after that. However, CIAM shows almost no interest for such ranking and therefore it was not done regurarly.

[22] The basic idea was to have World Cup events for not more than 1000 km to avoid distant trips. This rule was generalized to the whole world by introducing a time zone rule in 2007, which allows countries like USA, Canada, Brasil, Russia etc, which extend over three or more time zones to have two World Cup events in a time zone – better score in a time zone counts.

[23] Using this principle in wider sense a team from Republic of South Africa participated unofficially in 11th European SM Championships in Kosice (Slovakia) in 2007.

[24] The 1st Open Asian SM Championships was hold in Baikonur (Kazakhstan) in 2007 participated by 16 countries from 3 continets.

[25] This was too optimistic forecast, but today there are spacemodelling events in about 35 countries at 5 continets but Australia is still not incorporated in the FAI CIAM competition system. The pure technical base in the newcoming countries prevents fast increase of sportsmen.