Proposal to improve the formula used by World Pilot Ranking System, for all Hang- and Paragliding disciplines.

This proposal is made by the WPRS working group for the CIVL Plenary meeting 2007.

It is put forward to make following improvements to the formulas used in the WPRS.
The proposed formula is to be used for all the disciplines in both Hang- and Paragliding

The WPRS working group has been looking at the current formulas for the last year. While implementing the new WPRS software some shortcomings and faults in the current formulas were discovered.
The new formulas have been in the works for some time and tested on the real data in the WPRS database.
It is important to realize the formulas are done unbiased with the goal to improve the formulas to be fair and in line with the WPRS philosophy.
The main point being to rank pilots around the world in a fair manner, so the rankings will show the strength of each individual pilot, based on the competitions they have participated in.

To implement the change it is proposed to keep current rankings and points as they are in the system today and can be looked at and checked. The new formula takes over from March 1st 2007. All rankings from that date will use the new formulas and show the competitions in the last 3 years recalculated using the new formula.

Still the pilot (participant) points are based on the sum of 4 best competitions in the last 3 years with time devaluation (Td) as it is now. Time devaluation is important in the formula and not changed from current formula. The value of the competition should decrease over time, otherwise we would have a "all time best in last 3 years" ranking instead of a current ranking

There are number of issues with current version of the formulas so the WPRS does not serve its purpose as well as it should and could.

Main improvements in the formula:

- Rewarding Category 2 competitions 80% of the ranking points is dropped. This does mean that the winner can get up to 100 points in the strongest competitions (could be in a Category 2 competition). This is because the quality of the competition part of the formula is improved and the real strength of the competitions is used. This is very noticeable in strong competitions like the PWC paragliding competitions, resulting at a similar level as continentals and worlds. Also lower strength competitions will reward pilots with fewer points than before.
- Ranking points will use 1 decimal instead of whole numbers (for example 67,4 points instead of 67).
- Pilot points within a competition are not a linear function of pilot places in the results, but a normalized proportional to the winners score (total score in the results). By doing that the pilot points are relative to their performance within the competition, rather than just their place in the results.
- Improvements in using factors based on information from last competitions in that discipline (for example average number of pilots in competitions in last 12 months instead of fixed numbers for average number of pilots). Also eliminating steps based on fixed numbers (for example rather than using fixed steps of high ranking pilots, it used the ranking points directly). The result of those improvements is to use the same formula for all disciplines as the formula adjusts automatically based on changes in competitions.

The new formula will serve Paragliding Accuracy and Paragliding Aerobatics much better as they have been using the HG XC formulas, with the built in factors designed for HG competitions.

On following pages, the formula and issues are described in detail, with text in red to highlight the changes.

Also there are two sample pages comparing the value of competitions with the current formula and with the new formula, and one sample page showing Pilot points distribution.

More detailed explanation of the issues and improvements of the formula

Some of the issues with current formulas:

1. Pilot Quality Pq is calculated based on a stepped graph which is designed manually and do not relate directly to proportion of top ranked pilots participating relative to number of pilots in the ranking and their quality. Two versions are used, one for PG and one for all the other disciplines (which use half the "PilotRank" values).
   Due to this many competitions with less than top "quality" pilots get lumped together with max Pq.
2. Many pilots are equal in ranking, as ranking points are whole numbers.
3. Category 1 events get 25% higher points than category 2.
4. PG XC ranking: Winner get max regardless of Pq (only those from second to second last position is affected by Pq) meaning the winner of a competition with no ranked pilots can get same points as the winner of a competition with all the top ranked pilots. A way of getting to the top of the ranking is for a top 20 pilot to go to competitions with 80+ participants where no other top-ranked pilots participate. The winner would get 80 points.
5. All rankings except PG XC: number of participants do not affect winner points (only indirectly through Pq) meaning that the two top ranked pilots can have a two person comp and the winner still get > 20 points.
6. The pilot points are a linear function of the results

Factors to consider:

1. Position ranking (**Pp**):
   The value of a participant's effort in a competition relative to the other participants in the same competition. This is normalised from the actual total scores from the competition (Gap or other scoring formula)
2. Competition ranking (**Pq, Pn, Ta**):
   The value of the competition relative to other competitions in the same ranking (using the competitions in the last ranking prior to the competition as benchmark).
3. Time devaluation (**Td**):
   The value of the competition should decrease over time, otherwise we would have a "all time best" ranking instead of a current ranking.
4. The number of results that should count for a participant in the ranking. No change proposed so still it is 4 competitions in the last 3 years are used.

The real formula:

WPR = Pp*Pq*Pn*Ta*Td

To make the points more readable we multiply by 100 and round to 1 decimal.

WPR = round(Pp*Pq*Pn*Ta*Td*100, 1)

The participant's place in a given ranking (at a ranking date) will then be decided by the sum of the top 4 results.

Net results of the changes proposed is that the **competition ranking factor** will be different for ALL competitions and based on **real differences** in the number of top-ranked pilots participating and the number of pilots participating in the competition relative to the number of pilots in the ranking and in the average competition for the given ranking.

Pilot Points (Pp) (change from current formula)

The value of a person's effort in a competition relative to the other participants in the same competition is decided by the person's score in the final result list (as opposed to using the person's place in the results).
Pp is the actual total scores from the competition normalized to 1.0 points for first position and 0.0 points for the last position.

Pp = (score-last_pilot_score)/(winner_pilot_score-last_pilot_score)

Assuming that the scoring system used does actually in some way show a fair difference between pilots in the competition then this is the most fair and objective way of handing out Pp for the effort.
Current formula uses the pilots place in the results (seat) to distribute Pp. In PG XC a straight line from 1.0 for the winner to 0.0 for the last pilot is used. Other rankings use curve (power of 2.5) from the winner to the last pilot.

Competition ranking (Pq, Pn, Ta)

In a perfect competition with all the top pilots participating **c** should be 1.0.
So, what to do with all those other competitions? Winning a competition with only beginner pilots or a competition with only one participant should give a **c** close to 0.0.

We use three factors to measure the value of a competition:

1. The quality of the participants (**Pq**).
2. The number of participants compared to other competitions in same ranking (**Pn**).
3. The success of the competition (**Ta**).

Pq*Pn*Ta

Participant quality (Pq) (*change from current formula*)

Presumption: A competition with maximum quality of participants would be a competition where all the top ranked pilots participated.
To find **Pq** we use the last ranking prior to the competition and find the sum of ranking-points for all those pilots that are entered in the competition. Then we find the sum of ranking-points as it would have been if all the top ranked pilots had entered. This gives us 1.0 if all top ranked pilots are actually entered and 0.0 if no ranked pilots are entered.

To avoid **Pq** = 0 for comps with no ranked pilots set a lower limit of 0.2 as it is in current formula.

Pq = Pq_srp / Pq_srtp * (1 - Pq_min) + Pq_min

Pq_srp = "sum ranking-points of the participants"
Pq_srtp = "sum ranking-points if only the top-ranked pilots had entered"
Pq_min = "minimum Pq"

The main effect of this change from the current formula is that virtually no competition will get Pq = 1.0. Top competitions may get between 0.7 and 0.8 and there will be a difference between these whereas before all competitions over a given "standard" got 1.0.

Number of participants (Pn) (*change from current formula*)

Using only **Pq** means the currently 1st ranked pilot having a single-pilot competition will get max ranking points.
To remedy this we look at the number of pilots entered in the competition relative to the average number of pilots in all competitions in the last 12 months prior to the competition. This will mostly give a value between 0.0 and 2.0 (in the current WPRS database for every discipline).

Pn = "number of participants" / "avg. number of participants in all competitions in ranking"
if (**Pn** > Pn_max) **Pn** = Pn_max

Proposed to use **Pn_max** = 1.2, saying that a competition with slightly more than average no of participants is a good benchmark. This is really the same on the average as with current formula.

In PG XC ranking today one uses Pn = 1.0 if 80 or more pilots, average number of pilots in current WPRS competitions is 69 pilots.
In HG class 1 the average number of pilots in current WPRS competitions is 43 pilots.
Only PG XC uses Pn today. In other rankings the Pn is used indirectly in the formulas. There are more pilots in PG XC comps than others. This formula solves the issue of Pn on the average in competitions for each discipline. It will also take into account change of average number of participants in competitions, like increasing interest in Paragliding Accuracy and Paragliding Aerobatics. No formula change is needed if the average numbers of pilots change in the next years.

Success (Ta) *(small change from current formula)*

One last thing one may consider is the success of the competition (**Td**), ie was it a fair competition. Many ways to measure this, none is very objective or accurate.
As competitions in hanggliding and paragliding mostly involve a number of tasks we tend to use this as a measure of success.
Suggested values for **Td**:
0 tasks: 0
1 task: 0.25
2 tasks: 0.6
3 tasks: 0.9
4 tasks: 0.96
5 tasks: 0.98
6 tasks: 0.99
7 or more tasks: 1.0.
Current formula gives full value (1,0) for 4 tasks.

Time devaluation (Td) (as current formula)

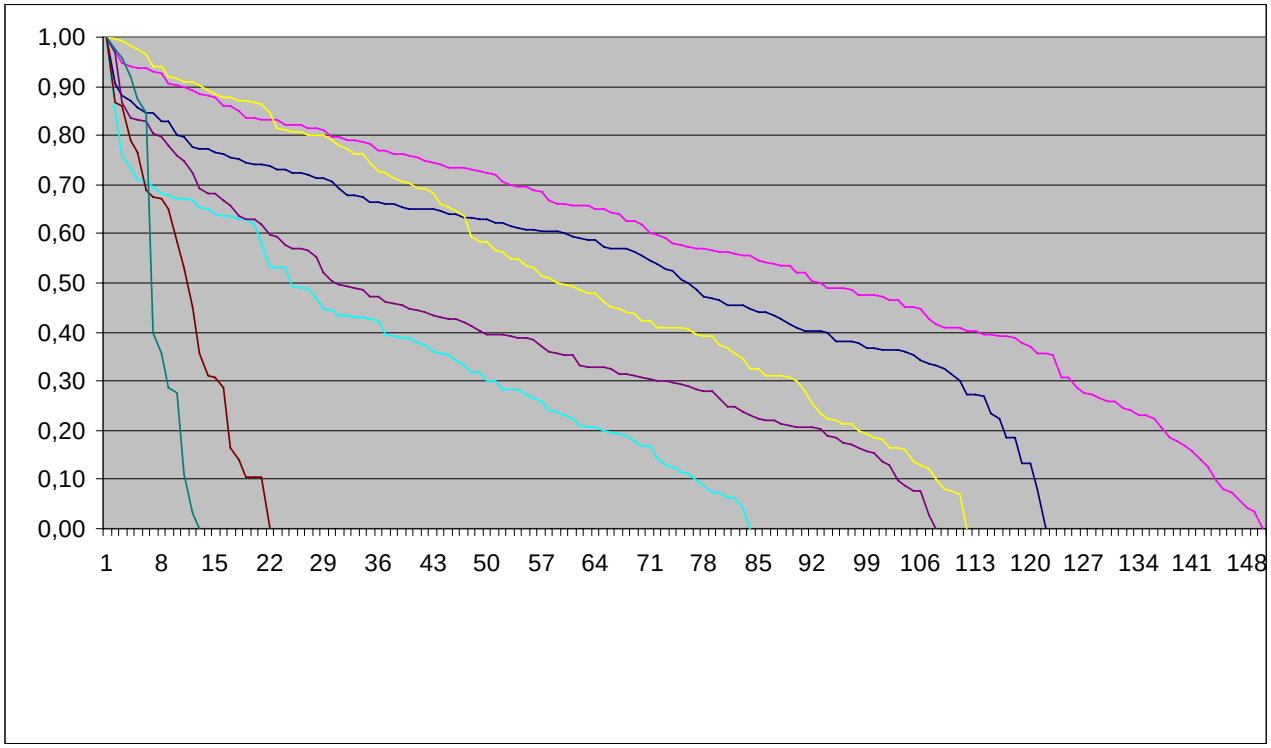
Td = 1/(1+ Td_a ^(DaysSinceEndOfComp/1096* Td_b - Td_b/2))

This gives an s-curve with x in the range 0 to 1096 (days or 3 years) and y going from 1.0 to 0.0.
Td_a = 2, **Td_b** = 20 (changing these will change shape of the s-curve).

Following are samples of information from the WPRS database to show the effect of the new formula compared to the current formula.

A sample graph that shows how Pp are distributed (from real data in WPRS)
This is just to show how points are distributed within a competition (that has a certain value as shown in samples).

The pilots get Pp relative to their real score in the competition.



Sample for Hanggliding.
Here is a sample of how the improved formula calculates the value of competitions compared to the current formula for Hanggliding competitions in the WPRS database.
The winner of the competition is awarded 100times the CompValue. So value of 0,93 gives 93 points for the winner. **Bold** is indicator of Category 1 competition (with the old value of 1,00).

Ladder	Competition	NewCompValue	OldCompValue
HG Class 1	**World Championships 03**	0,93	1,00
HG Class 1	**15th World Hang Gliding Championships 05**	0,90	1,00
HG Class 1	**15th FAI European HG Champs 2006**	0,81	1,00
HG Class 1	Australian Nationals 2003 HG	0,79	0,80
HG Class 1	Flytec Champs 03	0,79	0,80
HG Class 1	**European Championship 2004**	0,78	1,00
HG Class 1	2003 Wallaby Open	0,77	0,80
HG Class 1	Bogong Cup 2003	0,73	0,80
HG Class 1	Brazil Pre Worlds 02	0,71	0,80
HG Class 1	Australian Nationals 2005	0,69	0,80
HG Class 1	millau classic 03	0,69	0,80
HG Class 1	Flytec Championship 2002	0,68	0,80
HG Class 1	2002 Wallaby Open	0,68	0,80
HG Class 1	Croatian Championship 2005	0,67	0,80
HG Class 1	Flytec 2004	0,66	0,80
HG Class 1	Bogong Cup 2006	0,66	0,80
HG Class 1	Australian Nationals 2002	0,61	0,80
HG Class 1	**HG EC 2002 Class 1**	0,59	1,00
HG Class 1	Flytec HG 2006	0,59	0,80
HG Class 1	Australian Open - Open 02	0,59	0,80
HG Class 1	Big Spring Open 06	0,57	0,80
HG Class 1	2004 Hay Pre-Worlds	0,56	0,80
HG Class 1	Australian Open 2003	0,54	0,80
HG Class 1	2004 Hay Open	0,54	0,80
HG Class 1	Bogong Cup 2005	0,52	0,79
HG Class 1	2004 Bogong Cup	0,51	0,80
HG Class 1	French Open 06	0,50	0,80
HG Class 1	German Open 2005	0,49	0,72
HG Class 1	Bogong Cup 2002	0,49	0,80
HG Class 1	Valadares Open 03	0,48	0,71
HG Class 1	Canungra Classic 06	0,48	0,74
HG Class 1	championnat de france delta 03	0,48	0,73
HG Class 1	Sportavia International Open 06	0,47	0,80
HG Class 1	UK Nat. Champs 05 Lumbier	0,47	0,68
HG Class 1	NSW State Titles	0,46	0,66
HG Class 1	UK Nationals and Millau Open 2004	0,46	0,65
HG Class 1	C Classic 2005	0,45	0,62
HG Class 1	Gulong Classic 05	0,44	0,64
HG Class 1	Canungra Classic 2004	0,44	0,66
HG Class 1	French Nationals 05	0,43	0,53
HG Class 1	MILLAU CLASSIC 02	0,43	0,71
HG Class 1	Il Real Minas Open 02	0,43	0,76
HG Class 1	UK Nationals 06	0,42	0,52
HG Class 1	Canungra Classic 2003	0,40	0,47
HG Class 1	Flytec Flex US Nationals 05	0,40	0,69
HG Class 1	3rd International TIROL/AUSTRIAN Championship 2006	0,39	0,50
HG Class 1	St Bernards Canungra Classic 2001	0,39	0,53
HG Class 1	German Open 2002 FAI I	0,39	0,52
HG Class 1	2003 UK Nationals	0,38	0,37
HG Class 1	Spanish National, Arcones 02	0,37	0,37
HG Class 1	Canungra Classic 2002	0,37	0,46
HG Class 1	Brasilia Open 2002	0,36	0,65

Sample for Paragliding.
Here is a sample of how the improved formula calculates the value of competitions compared to the current formula for Paragliding XC competitions in the WPRS database.
The winner of the competition is awarded 100times the CompValue. So value of 0,96 gives 96 points for the winner. Main changes are higher value for the PWC competitions, because they are strong competitions. **Bold** is indicator of Category 1 competition (with the old value of 1,00).

Ladder	Competition	NewCompValue	OldCompValue
Paragliding	**9 World PG Championship 05**	0,96	1,00
Paragliding	PG World Cup Slovenia 2006	0,96	0,80
Paragliding	World Cup Bourg St Maurice 05	0,95	0,80
Paragliding	PG World Cup Talloires 04	0,93	0,80
Paragliding	**9th FAI European Paragliding Championship 06**	0,92	1,00
Paragliding	World Cup Brazil 2006	0,91	0,80
Paragliding	World Cup Monte Cornizzolo 05	0,90	0,80
Paragliding	PG World Cup Crans Montana 03	0,89	0,80
Paragliding	**World PG Championships 2003**	0,88	1,00
Paragliding	**WAG PG 01**	0,88	1,00
Paragliding	**Europeans Champs 2004**	0,86	1,00
Paragliding	PG World Cup Turkey 04	0,85	0,80
Paragliding	World Cup La Clusaz 03	0,84	0,72
Paragliding	World Cup Serbia 05	0,83	0,80
Paragliding	PWC Mexico 02	0,83	0,80
Paragliding	World Cup Mexico 04	0,81	0,72
Paragliding	PWC Slovenia 01	0,81	0,80
Paragliding	**European PG Championships 02**	0,80	1,00
Paragliding	PWC Spain 01	0,79	0,80
Paragliding	PWC Morzine 02	0,78	0,80
Paragliding	World Cup Portugal 05	0,76	0,72
Paragliding	World PG Cup La Reunion 03	0,76	0,77
Paragliding	PG World Cup Japan 03	0,74	0,72
Paragliding	PWC Greece 01	0,74	0,72
Paragliding	PWC Monte Cornizzola 02	0,74	0,80
Paragliding	PWC France 01	0,73	0,72
Paragliding	Pre-Worlds 2006	0,65	0,80
Paragliding	British Open Castejon 04	0,65	0,66
Paragliding	PWC Turkey 02	0,65	0,80
Paragliding	Italian Champs 06	0,64	0,60
Paragliding	British Open Ager 06	0,62	0,48
Paragliding	Australian Paragliding Open - Manilla 2001	0,60	0,80
Paragliding	World Cup Bulgaria 05	0,57	0,48
Paragliding	French Nationals 2004	0,55	0,68
Paragliding	PG World Cup Austria 2004	0,54	0,48
Paragliding	Australian Open 03	0,54	0,63
Paragliding	Nordic PG Open 01	0,54	0,80
Paragliding	Swiss International Championship 06	0,53	0,69
Paragliding	French Championships 03	0,53	0,73
Paragliding	Manilla Paragliding Open 2004	0,53	0,61
Paragliding	British Open Montalegre 06	0,53	0,41
Paragliding	British Open Piedrahita 2005	0,53	0,54
Paragliding	Czech Open	0,53	0,60
Paragliding	Aussie Nationals 2006- Bright 321	0,53	0,44
Paragliding	Slovenian Open 06	0,52	0,43
Paragliding	New Zealand Nationals 03	0,52	0,56
Paragliding	Nordic Open 2003	0,51	0,59
Paragliding	Manilla PG Open 02	0,51	0,74
Paragliding	Int. German Open 2003 - Paragliding	0,51	0,52
Paragliding	Dutch Open 2005	0,51	0,45