A Unified Racing Scoring Formula for CIVL and PWCA

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Document history

Version	Date	Author	Changes
1.6	07.03.2025	Jörg Ewald	After Paragliding session, update sections 7, 8 and 10. • Proposal 1.1 (section 7.1.1): Changed from 95% to 96% • Proposal 1.4 (section 7.2.2): Keep Line as control zone • Proposal 1.11 (section 7.3.2): Same turnpoint tolerance for all competitions • Proposal 1.18 (section 7.5.3): Leading Weight is still adjustable per task, but limited to 26% instead of 50% • Proposal 1.22 (7.7.1): Use PWCA criteria for validity of stopped tasks • Proposal 1.24 (section 7.7.3): Use PWCA bonus glide ratio of 2.5 for paragliding • Proposal 1.27 (naming): Moved to proposal 2.12 (section 8.5.1) to allow for a single vote on all of proposal 1. • Proposal 2.1 (8.1.1): Change from 95% to 96% • Proposal 2.3 (8.2.1): Withdrawn • Proposal 2.4 (8.2.2): Updated the names • Proposal 2.7 (8.3.1): Changed algorithm from Karney to the one proposed by Daniel Dimov (exact name and reference to be determined). • Proposal 2.8 (8.3.2): Increase absolute tolerance from 3m back to original 5m, remove relative tolerance. • Proposal 2.9 (8.4.1): Withdrawn • Proposal 2.11 (8.4.3): Added
1.5	07.03.2025	Jörg Ewald	After Hang-gliding session, update section 9: • Proposals 3.1 (section 9.1.1), 3.2 (section 9.2.1), 3.3 (section 9.3.1), 3.4 (section 9.4.1), 3.5 (section 9.5.1): withdrawn, to be discussed within the HG committee and presented for voting at the 2026 Plenary. • Proposal 3.6: updated, 15 minutes instead of 5 minutes
1.4	22.01.2025	Jörg Ewald	Referencing section 8.4.1 in section 7.7.1.3
1.3	06.01.2025	Jörg Ewald	Added section 9.6 Score-back Time
1.2	04.01.2025	Jörg Ewald	Added summary tables to sections 7, 8, and 9
1.1	02.01.2025	Jörg Ewald	Various edits for increased clarity
1.0	01.01.2025	Jörg Ewald	Start

Contents

1 Summary

This document proposes a comprehensive initiative to unify the scoring formulas used by CIVL (Commission Internationale de Vol Libre) and PWCA (Paragliding World Cup Association) for paragliding and hang-gliding competitions. This proposal aims to streamline the scoring process, reduce complexity, and foster collaboration between these two global bodies overseeing our sport.

1.1 Key Aspects

1. **Unification**: The proposal merges the current CIVL and PWCA formulas into a single, unified scoring system, addressing 26 identified differences between the existing formulas.
2. **Improvements**: It proposes 11 specific enhancements to the unified formula, to further improve, simplify and streamline the formula.
3. **Harmonization**: The proposal minimizes differences between hang-gliding and paragliding scoring where possible, addressing 8 areas of divergence.
4. **Collaboration Framework**: It establishes a structure for ongoing cooperation between CIVL and PWCA for future formula development.

1.2 Benefits

- Reduced complexity for pilots, organizers, officials, and software developers
- More efficient resource utilization in documentation and software implementation
- Clearer, more consistent scoring across all major competitions
- Improved transparency and understanding of the scoring process
- Facilitated comparison of results across different competitions and seasons
- Enhanced fairness and consistency in pilot performance evaluation

1.3 Implementation

The document outlines a timeline for adopting the unified formula, including approval processes for both CIVL and PWCA, and the establishment of a joint working group for future development.

By adopting this unified approach, the sport stands to benefit from a more streamlined, efficient, and consistent scoring system that serves the needs of all stakeholders in paragliding and hang-gliding competitions.

2 What we want to achieve

This section outlines the vision and key objectives for unifying the scoring formulas used by CIVL and PWCA in paragliding and hang-gliding competitions. By aligning these systems, we aim to create a more consistent, efficient framework that benefits all stakeholders in the sport. The following provides a roadmap for achieving this unified approach.

2.1 The vision for a unified scoring formula

Our vision is that in the future, there will be a single racing scoring formula that is used and jointly developed by both global organizations: CIVL and PWCA. This unified scoring formula will:

- Create a single, authoritative standard for paragliding and hang-gliding competition scoring worldwide.
- Eliminate confusion and discrepancies between different scoring systems.
- Bundle improvement efforts and streamline the development process for future improvements.
- Ensure consistent evaluation of pilot performance across all major competitions.

2.2 The key objectives

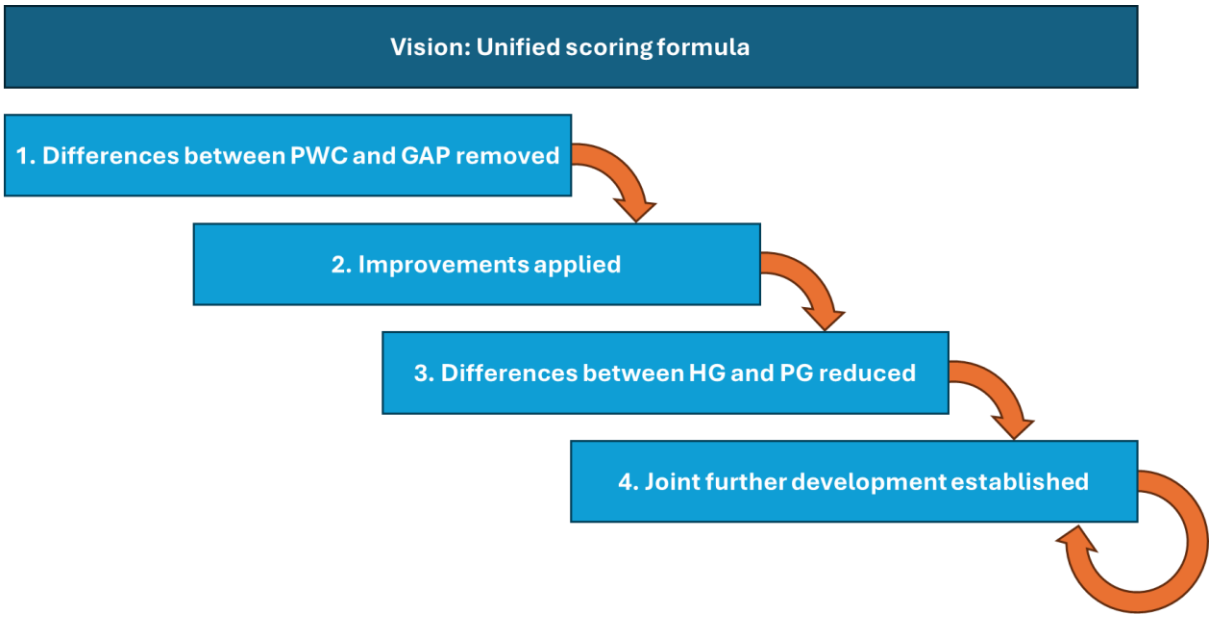

Figure 1: Vision and goals overview

To achieve this vision, we want to reach four goals, as shown in Figure 1:

1. Remove the differences between the PWCA and CIVL paragliding racing scoring formulas.
    a. Harmonize all 26 identified differences between the current formulas.
    b. Remove unintended variations that have emerged over time.
    c. Create a single, clear specification for implementers, officials, organizers and pilots.
2. Improve the unified formula.
    a. Incorporate 11 specific improvements.
    b. Leverage work done outside the free-flight community to rely on proven concepts, simplify documentation and reduce the implementation effort.
    c. Enhance the formula's ability to accurately reflect pilot performance.
3. Within CIVL, reduce the difference between hang-gliding and paragliding scoring.
    a. Evaluate and address the 8 areas of divergence between the disciplines.

   b. Maintain only those differences that are essential due to the unique characteristics of each sport.
   c. Create a more unified approach to scoring across all free flight competitions.
4. Establish a collaborative development process.
   a. Create a joint working group with representatives from both CIVL and PWCA.
   b. Define a clear procedure for proposing, evaluating, and implementing future changes.
   c. Ensure that both organizations can adopt new versions at their own pace while maintaining overall unity.

By achieving these goals, the unified formula will:

- Reduce complexity for pilots, organizers, officials and software developers.
- Increase transparency and understanding of the scoring process.
- Facilitate easier comparison of results across different competitions and seasons.
- Promote fairness and consistency in the evaluation of pilot performance.
- Foster closer collaboration between CIVL and PWCA in other areas of competition management.
- Use the limited resources for documentation and software implementation more efficiently.

3 Background: Why we need a unified scoring formula

This section gives the necessary background to the idea of a unified scoring formula. It explains the current situation where two separate, but very similar formulas exist, highlighting the costs and complexities associated with maintaining multiple systems. The section also provides context on the historical development of these formulas and introduces a way forward to address the challenges. Finally, it offers information about the author's experience with the subject of competition scoring.

3.1 How we ended up with two near-identical formulas

CIVL and PWCA are the two global governing bodies that oversee paragliding (both) and hang-gliding (CIVL only) competitions. They both maintain their own scoring formula for races, as shown in Figure 2.

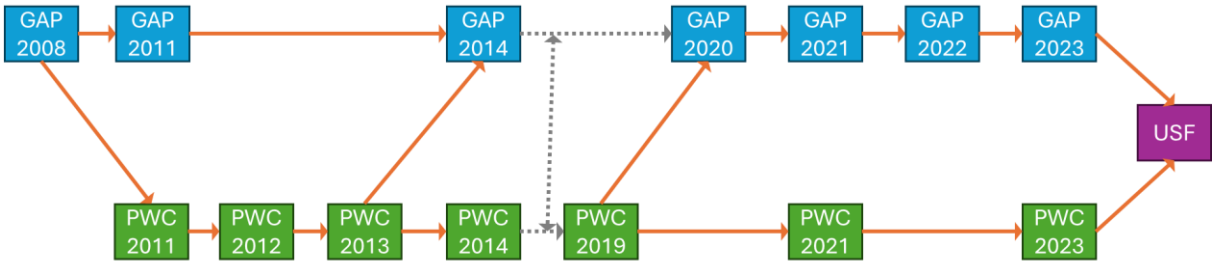

Figure 2: Scoring formula evolution, with proposed Unified Scoring Formula (USF)

3.1.1 CIVL, overseeing FAI competitions

Since the introduction of GPS flight recording for scoring purposes, CIVL has been using a scoring formula called “GAP”. This formula has been changed regularly over the years. The latest edition, “GAP 2023”, is defined in the “FAI Sporting Code Section 7 F – XC Scoring” (“S7F” for the remainder of this document), Edition 2023.

Changes to all CIVL rules, including scoring formula changes, must be proposed to and approved by the annual CIVL Plenary. Approved formula changes are then documented in S7F and implemented in time for the next following FAI Category 1 event (World or continental championships).

Since CIVL only oversees a relatively small number of top-level events every year (world or continental championships), this pace of change has worked well for them.

3.1.2 PWCA, organizer of the Paragliding World Cup events

For about a decade, the PWCA used their very own way of evaluating and scoring flights documented by GPS tracklogs. From around 2007, they increasingly incorporated concepts of GAP in their formula, like Task Validity. In 2011 they adopted GAP 2008, but right away made a few crucial modifications, which were later adopted by CIVL. Since then, the formula has been changed regularly. The latest edition is “PWC 2023”, as defined in the “PWCA Competition Rules Season 2023” (“PWCA rules” for the remainder of this document), Appendix C.

Changes to the rules, including the scoring formula, are usually decided for the upcoming season by the PWCA Committee during their fall meeting, and then published in the corresponding PWCA rules.

Given the relatively high number of high-level events overseen by PWCA, there have been cases in the past where issues with the scoring formula were addressed mid-season, leading to ad-hoc formula changes from one event to another. The need for such agility must be considered when designing a process for further development of a unified formula.

From around 2008 to 2023, the PWCA used CompCheck as its scoring software. Analysis of published results showed that CompCheck's implementation sometimes differed from the published specifications. To fully understand the distinctions between GAP and the PWCA formula, we here consider both the official PWCA rules and CompCheck's de-facto implementation, to the extent where implementation details are known.

3.2 How different are they really?

While both formulas derive from the formula known as GAP, over the years, several slight differences were introduced by both CIVL and PWCA, some accidental, some due to limitations of the software that implemented the formula, some because one of the organizations saw a need for a change. While many changes introduced by the PWCA were eventually adopted by CIVL (and once or twice in the other direction as well), to date, we find several differences between their latest formulas, "GAP 2023" and "PWC 2023".

A thorough analysis shows that these differences fall into one of three categories:

1. The difference does not serve any sportive purpose and can be eliminated with negligible impact on all future competitions.
2. There are good arguments for either version and picking one or the other will only have a negligible effect as well.
3. In one case, the difference comes from a change introduced by the PWCA that should have been adopted by CIVL, and most likely would be adopted at the next occasion anyway.

3.3 The cost of two formulas

Having two near-identical formulas for the same kind of events has considerable downsides:

- Maintaining the documentation of both formulas takes effort and time.
- Maintaining two formulas in scoring software systems also takes a considerable effort and time.
- Pilots, especially top-level competitors who are exposed to both formulas in important competitions, voice confusion, and observably waste considerable time worrying about the differences between the formulas (which are often overestimated), and how these should influence their flying tactics.
- Organizers, scorers and competitors who are exposed to both formulas frequently assume that because something is done one way in the PWCA formula, it will be done the same in CIVL's formula. This confusion is unnecessary.

In general, we see a lot of potential for removing at least some of the complexity inherent to our sports by combining the two organizations' efforts and having only a single, unified scoring formula going forward.

3.4 The hang-gliding perspective

Within CIVL, yet another bifurcation of GAP exists: GAP for hang-gliding differs from GAP for paragliding in some subtle and some less subtle ways. Most of the differences are rooted in changes adopted from the PWCA, which were only applied to paragliding. Others go back to the very beginning of GAP, and beyond, to the pre-GPS era. The cost of maintaining the paragliding and hang-gliding variations of GAP in documentation and software again is considerable. Therefore, all the differences should be evaluated for their sportive merit. Ideally, the unification effort proposed here also reduces the differences between the scoring formula variations used for hang-gliding and paragliding competitions.

3.5 About the author

I have been a paraglider pilot since 1992, was a competitor from 2002 to 2020, and I competed in the Paragliding World Cup from 2004 to 2020. My racing career ended at my peak WPRS position of 51.

Besides flying competitions, I have also been involved in scoring since 2002. In this area I contributed to both PWCA and CIVL:

- Since 2011: Main responsible for FsComp, CIVL's official scoring software for racing competitions: updates for scoring formula changes (both GAP and PWCA), usability improvements, bug fixing and trouble shooting. This includes support to all score keepers who use FsComp.
- 2011 & 2012: Author and editor of the PWCA rules, the first two editions to include a specification of their GAP-based scoring formula.
- Since 2012: Author and editor of the document that is now S7F.
- Advisor to both organizations for scoring-related topics, initiated multiple formula changes.
- Collaboration with score keepers, Stewards and Jury at several World and continental championships.
- Live presentations about scoring to the CIVL Bureau, and to competitors at various World and European championships.

Since 2021, through Volirium's "Scoring as a Service" offering, me and a coworker have scored all Swiss hang-gliding and paragliding competitions, and a growing number of international competitions. This experience has led to several improvements in FsComp and made me even more aware of the unnecessary complexity that comes from having two near-identical scoring formulas.

4 Potential challenges, and how to address them

Based on the proposed unification of scoring formulas for CIVL and PWCA, we identified several areas with potential challenges that must be addressed to ensure the success of the Unified Scoring Formula initiative. Table 1 provides an overview, with details in the following subsections.

Challenge	Proposed mitigation
Organizational alignment	1. Leverage increased collaboration between CIVL and PWCA 2. Utilize growing group of people active in both organizations
Technical effort	Focus work on a single formula instead of two, reducing overall effort
Community resistance	3. Provide specific Q&A sessions for officials 4. Keep existing formula versions available for unsanctioned events 5. Communicate minimal changes and their basis in existing concepts to pilots
Hang-gliding specific issues	Maintain flexibility to accommodate discipline-specific scoring elements where necessary
Resource allocation	6. Hire outside help for new rule document versions 7. Establish clear communication channels between CIVL and PWCA 8. Ensure transparent decision-making processes in joint working group

Table 1: Challenges and their proposed mitigations

4.1 Organizational alignment

Challenges:

1. Alignment of Decision-Making Processes:
    a. CIVL and PWCA have different approval processes for rule changes.
    b. Synchronizing these processes to maintain a unified formula may be difficult.
2. Loss of Autonomy:
    a. Both organizations may be concerned about losing independent control over their scoring systems.
    b. Resistance to compromising on certain aspects of their current formulas.

Mitigation:

1. The last few years saw a marked increase in collaboration between the two organizations.
2. A growing group of people is active for both organizations, at all levels: competition organizers, staff, officials and members of the Bureau and Committee, respectively.

4.2 Technical effort

Challenges:

1. Existing scoring software will need to be updated to accommodate the unified formula.
2. Transition Period: Implementing the new formula across the major competitions may not happen simultaneously.

Mitigation:

This is no different from previous years, with the benefit that now the work will only have to be done for one instead of two formulas.

4.3 Community resistance

Challenges:

1. Officials may require additional information to decide on the individual changes that comprise the unification.
2. Some competition organizers may prefer their current scoring methods.
3. Pilot adaptation:
    a. Pilots accustomed to specific scoring nuances may resist changes.
    b. There may be concerns about how the new formula affects tactics and strategies.

Mitigation:

1. Officials: Provide specific Q&A sessions
2. Organizers: The existing formula versions will remain available for organizers of FAI Category 2 and unsanctioned events to use.
3. Pilots: Good communication will be key, to point out how minimal the changes are, and that they are mainly based on concepts that had already been in use by one or the other organization.

4.4 Hang-gliding specific issues

Challenges:

1. Proposals to unify hang-gliding and paragliding scoring (e.g., removing Arrival Points) may face resistance from the hang-gliding community.
2. Concerns about losing specialized scoring elements tailored to hang-gliding competitions.

Mitigation:

1. Maintain flexibility to accommodate discipline-specific scoring elements where necessary.

4.5 Resource allocation

Challenges:

1. Documentation: Significant effort will be required to update rules and documentation.
2. Ongoing Maintenance: Establishing and maintaining a joint working group for future formula development will require ongoing commitment from both organizations.

Mitigation:

1. Documentation: hire outside help to produce new versions of the rule documents that reflect the change to a unified scoring system.
2. Establish clear communication channels between CIVL and PWCA.
3. Ensure transparent decision-making processes in the joint working group to build trust among stakeholders.

5 Implementation plan

To implement the vision and reach the goals stated at the top of this document, the following steps are required:

1. The CIVL Plenary and the PWCA Committee both
    a. agree on and approve Proposals 1 (section 7) and 2 (section 8), or the identical modifications thereof.
    b. define a date from when on their competitions will use this unified formula. The two dates can be different from each other.
2. The CIVL Plenary approves Proposal 3 (section 9), or some modification thereof.
3. The CIVL Bureau and the PWCA Committee define and implement the necessary collaboration for future scoring formula development, as outlined in section 10. Since this does not lead to any change of CIVL's rules themselves, CIVL Plenary involvement is not required.
4. Adoption of future versions
    a. will be proposed to and approved by the CIVL Plenary on an annual basis.
    b. will be decided on by the PWCA Bureau on an annual basis, or as required for specific competitions they oversee.

Figure 3 shows a potential implementation timeline, based on CIVL approval at the 2025 Plenary (March 6-9), and PWCA approval shortly after. According to this plan, the unified formula will be available from June 2025, in time for CIVL's hang-gliding sports class world championships.

Figure 3: Implementation plan

6 Proposals and suggestions overview

The remainder of this document consists of four parts, containing three proposals and a suggestion, as illustrated in Figure 4.

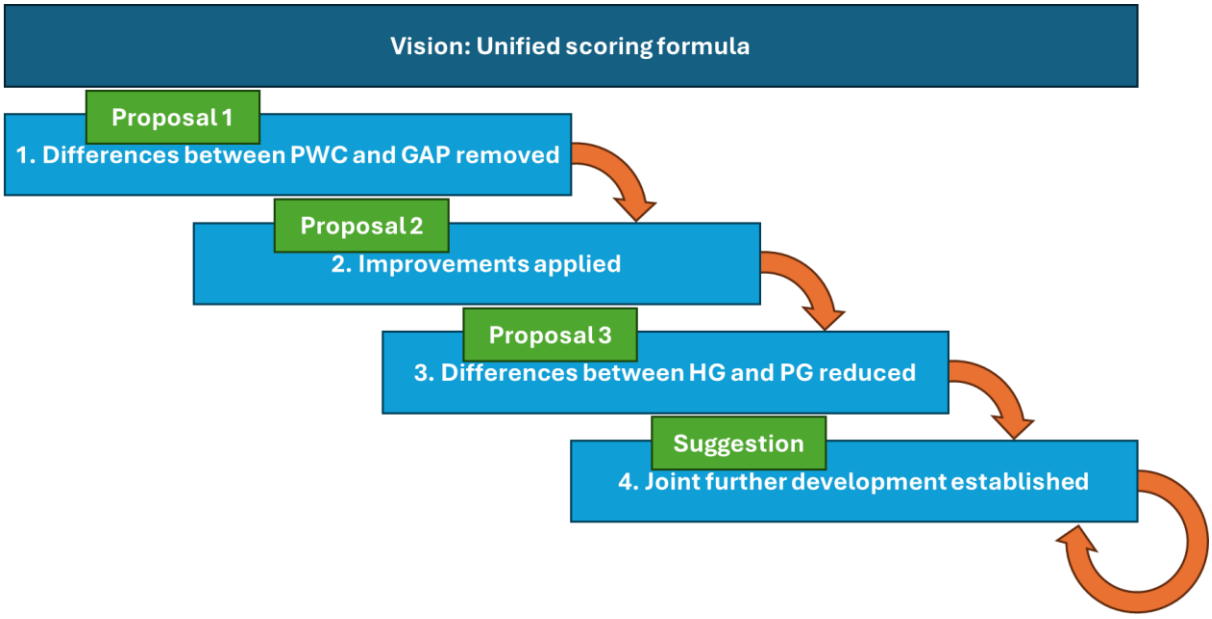

Figure 4: Proposal overview

1. Proposal 1: Unification of scoring formulas for paragliding (section 7)
    a. Addresses the 26 identified differences between CIVL and PWCA formulas.
    b. Proposes specific solutions for each difference to create a single, unified formula.
    c. Covers aspects such as competition parameters, task definition, flight evaluation, and stopped tasks handling.
2. Proposal 2: Unified formula improvements (section 8)
    a. Suggests 11 enhancements to the newly unified formula.
    b. Includes improvements in competition parameters, control zone definitions, and Leading calculation methods.
    c. Aims to leverage work done outside of the free-flying community, to base the formulas on proven scientific concepts, simplify documentation and reduce the effort required for implementation.
3. Proposal 3: Hang-gliding and paragliding unification (section 9)
    a. Identifies the 8 differences between hang-gliding and paragliding scoring.
    b. Proposes solutions to minimize differences where possible.
    c. Addresses topics such as arrival points, distance points calculation, and leading coefficient.
4. Suggestion for a joint future scoring formula development (section 10)
    a. Presents a rough outline of a collaboration between PWCA and CIVL for the future development of the scoring formula.

7 Proposal 1: Unification of the scoring formulas for paragliding racing

This section lists the 26 differences between GAP 2023 and PWC 2023, see Table 2. For each, a sub-proposal, identified as "P1.x", is presented, to identify the more suitable of the two variations for the unified formula, or in some cases a combination of the two variations. Where applicable, section 8 offers further enhancements to these proposals.

Main topic	Differences
Competition parameters	1. Nominal Launch (7.1.1) 2. Score-back Time (7.1.2)
Task definition	3. Task typed (7.2.1) 4. Control zones (7.2.2) 5. Control zone definition (7.2.3) 6. Start procedures (7.2.4) 7. Race type (7.2.5) 8. Task Distance (7.2.6) 9. Speed Section Distance (7.2.7)
Flight evaluation	10. Distance calculation (7.3.1) 11. Turnpoint tolerance (7.3.2) 12. Crossing time (7.3.3) 13. Criteria for reaching a turnpoint cylinder (7.3.4)
Task Validity	14. Launch Validity (7.4.1) 15. Distance Validity (7.4.2)
Points allocation	16. Goal Ratio (7.5.1) 17. Distance Weight (7.5.2) 18. Leading Weight (7.5.3) 19. Available points (7.5.4)
Pilot score	20. Beginning of the Time-Distance graph (7.6.1) 21. Leading Coefficient calculation (7.6.2)
Stopped task	22. Minimum Time (7.7.1) 23. Bonus Distance (7.7.2) 24. Bonus Glide Ratio (7.7.3)
Competition ranking	25. Decimals in competition results (7.8.1) 26. FTV factor (7.8.2)

Table 2: Differences between the GAP 2023 and PWC 2023 scoring formulas

7.1 Competition parameters

7.1.1 P1.1: Nominal Launch – amended

7.1.1.1 PWCA

The Nominal Launch parameter is a fixed number, 5, which is implicitly set. The meaning is that Launch Validity will only be devalued if more than those 5 pilots decide not to launch.

This is because PWC events traditionally always have between 100 and 120 participants, and when this parameter was introduced, no thought was given to smaller competitions that may also use the PWCA formula.

7.1.1.2 CIVL

The Nominal Launch parameter is a competition parameter, and is given as a percentage, with a default of 95%. The meaning is that Launch Validity will only be devalued if fewer than the set percentage of the pilots present at launch decide not to launch.

By using a percentage, GAP also works well for smaller competitions, where the threshold for Launch Validity devaluation is lowered relative to the number of participants. The PWCA's original "5 pilots out of 120" would translate to 96%, but for simplicity's sake the default was set to 95%.

7.1.1.3 Proposal P1.1

Nominal Launch is given as a percentage, with a default of 96%, and the meaning that Launch Validity will be devalued if fewer than the set percentage of pilots decide not to launch.

The new formula should work well for competitions of all size s, which makes the CIVL version favourable. We use 96% because that maintains the "5 pilots in a 120-pilots field" from the PWCA.

See also 8.1.1 P2.1: Fixed value for Nominal Launch.

7.1.2 P1.2: Score-back Time

In the case of a stopped task, the Score-back Time defines the difference between the time when the task stop was announced, and the time until which the pilots' flights will be considered for scoring.

7.1.2.1 PWCA

The Score-back Time is fixed at 5 minutes: The task is scored up to 5 minutes before the Task Stop Announcement Time.

7.1.2.2 CIVL

The Score-back Time is a Competition Parameter, with a default of 5 minutes: The task is scored up to the set time before the Task Stop Announcement Time.

When this was introduced, there was some concern that 5 minutes may be insufficient, and organizers may want to choose 10 or even 15 minutes instead.

7.1.2.3 Proposal 1.2

Score-back Time is a fixed value of 5 minutes.

Experience shows that the 5 minutes defined by the PWCA are sufficient – otherwise the PWCA certainly would have adjusted the value.

7.2 Task definition

7.2.1 P1.3: Task types

7.2.1.1 PWCA

One task type: Race

7.2.1.2 CIVL

Two task types: Race and Open Distance

7.2.1.3 Proposal 1.3

The only task type is Race.

Experience shows that Open Distance tasks are only set very rarely, in smaller competitions, if at all. We can therefore spare the effort to maintain this choice in documentation and software.

7.2.2 P1.4: Control zones - amended

7.2.2.1 PWCA

The control zones for tasks are Circle, and Goal Semi-circle.

7.2.2.2 CIVL

The control zones for tasks are Circle, Line, and Goal Semi-circle.

7.2.2.3 Proposal 1.4

The control zones for tasks are Circle, Line, and Goal Semi-circle.

See also 8.2.1 P2.3: Control zones

7.2.3 P1.5: Control zone definition

7.2.3.1 PWCA

For each turnpoint cylinder, a crossing direction is defined: Enter or Exit. To reach each turnpoint requires a crossing in the defined crossing direction.

7.2.3.2 CIVL

The crossing direction of a turnpoint cylinder is no longer defined. A crossing in any direction can count as reaching a turnpoint. The ideal crossing direction is implicitly defined by the location of the following turnpoint cylinder.

7.2.3.3 Proposal 1.5

The crossing direction of a turnpoint cylinder is no longer defined. A crossing in any direction can count as reaching a turnpoint. The ideal crossing direction is implicitly defined by the location of the following turnpoint cylinder.

This way task setters are prevented from the classic mistake of setting an enter start cylinder when the following turnpoint cylinder lies outside the start cylinder, which leads to dangerous two-way traffic situations right at the start when pilot density is the highest.

7.2.4 P1.6: Start procedures

7.2.4.1 PWCA

The only start procedure is Air Start.

7.2.4.2 CIVL

Start procedures are Air Start and Ground Start.

7.2.4.3 Proposal 1.6

The only start procedure is Air Start.

Ground Start has not been in use for decades and would not be considered a fair and safe race start method today. Therefor we can easily remove it.

7.2.5 P1.7: Race type

7.2.5.1 PWCA

The race types are Race to Goal, Clock Start, and Elapsed Time.

7.2.5.2 CIVL

The race types are Race to Goal with 1 or multiple start gates, and Elapsed Time.

7.2.5.3 Proposal 1.7

The race types are Race to Goal with 1 or multiple start gates, and Elapsed Time.

PWCA's "Clock Start" and CIVL's "Race to goal with multiple start gates" stand for the same thing. "Multiple start gates" is a more telling name, let's use that.

7.2.6 P1.8: Task Distance

7.2.6.1 PWCA

Task Distance: The shortest possible distance a pilot has to fly to finish the task. Launch is defined as an Exit cylinder.

7.2.6.2 CIVL

Task Distance is defined as the distance of the optimized path from launch to goal. Launch is defined as a single point.

7.2.6.3 Proposal 1.8

Task Distance is defined as the distance of the optimized path from launch to goal. Launch is defined as a single point.

Defining launch as a single point does not change the task in any way but simplifies both the Task Distance calculation, and the task setter's job: With a cylinder, if it's too small, some pilots may inadvertently launch outside of it and not complete the task. On the other hand, setting a bigger launch cylinder diminishes the actual Task Distance.

7.2.7 P1.9: Speed Section Distance

7.2.7.1 PWCA

Speed Section Distance: The shortest possible distance a pilot has to fly from the SSS to the ESS.

7.2.7.2 CIVL

Speed Section Distance is defined as the distance of the optimized path from launch to ESS, minus the distance of the pre-start part.

7.2.7.3 Proposal 1.9

Speed Section Distance is defined as the distance of the optimized path from launch to ESS, minus the distance of the pre-start part.

Looking at the Speed Section by itself, as the PWCA rules define, and measuring its optimized distance, without the context of where launch lies, can lead to Speed Section Distances that are much lower than the distance pilots effectively cover after starting the race. This then leads to a distortion of the Leading Points' weight function, where the initial part of the flight with no or negligible impact on leading points is extended.

Using CIVL's definition leads to a Speed Section Distance that better reflects what pilots will experience in all cases. They may be able to take the start closer to goal and thus reduce their distance to ESS. This will also distort the leading points' weight function, but to the favour of such pilots.

7.3 Flight evaluation

7.3.1 P1.10: Distance calculation

7.3.1.1 PWCA

The distance between two points (e.g., waypoint and tracklog point) which are given as WGS84 coordinates is calculated by first projecting the points onto a plane using a scaled Transverse Mercator projection. The actual distance is then calculated using Pythagoras' theorem.

7.3.1.2 CIVL

The distance between two points (e.g., waypoint and tracklog point) which are given as WGS84 coordinates is calculated directly on the WGS84 ellipsoid.

7.3.1.3 Proposal 1.10

The distance between two points (e.g., waypoint and tracklog point) which are given as WGS84 coordinates is calculated directly on the WGS84 ellipsoid.

This yields more precise results than the PWCA's planar approach. The actual algorithm used to do this calculation is not prescribed. FsComp uses Vincenty's algorithm, which is widely accepted for such problems and offers very high accuracy. Instrument manufacturers are free to use one of the multiple other algorithms that may be better suited to the available processing power and the required accuracy of 1m.

See also 8.3.1 P2.7: Define algorithm for geodesic calculations

7.3.2 P1.11: Turnpoint tolerance – amended

Turnpoint tolerance addresses a technical issue: flight instruments and scoring software may use different methods to calculate distances to waypoints, potentially leading to slight discrepancies. This tolerance accounts for these differences, allowing for minor misses of turnpoint cylinders.

While originally a technical solution, many stakeholders now view this tolerance as a sportive one, softening the strict rule of scoring flights only up to missed turnpoints.

7.3.2.1 PWCA

Turnpoint tolerance is defined as "on all radii", with a value of 0.1% of the turnpoint cylinder radius.

In addition to the above, CompCheck also applies an undocumented tolerance to the goal line. This is purely a sportive tolerance, softening the strict rule of task completion only upon crossing the goal line, as there's no technical justification for it at such short distances from the waypoint.

7.3.2.2 CIVL

1. The minimum absolute tolerance is 5 m.
2. For FAI Category 1 events, the tolerance is 0.1% of the turnpoint cylinder radius.
3. For FAI Category 2 events, the tolerance lies between 0.1% and 0.5% of the turnpoint cylinder radius, with a default at 0.2%.

7.3.2.3 Proposal 1.11

1. The tolerance is the bigger of 5 m and 0.1% of the cylinder radius
2. This tolerance also applies to the straight portion of the goal semi-circle

See also 8.3.2 P2.8: Reduce Turnpoint Tolerance

7.3.3 P1.12: Crossing time

The crossing time is the time when a particular turnpoint cylinder has been crossed. This is particularly relevant for the SSS and ESS cylinders.

7.3.3.1 PWCA

The actual crossing time is found by interpolating between the timestamps of the last tracklog point before crossing and the first tracklog point after crossing.

7.3.3.2 CIVL

Crossing time for each valid crossing is the time at which the corresponding tracklog point was recorded.

7.3.3.3 Proposal 1.12

Crossing time for each valid crossing is the time at which the corresponding tracklog point was recorded.

With modern devices recording positions every second, interpolation is no longer necessary. Instead of calculating a theoretical time, we can use the actual timestamp of the tracklog point indicating a crossing as the crossing time.

7.3.4 P1.13: Criteria for reaching a turnpoint cylinder

7.3.4.1 PWCA

For each turnpoint claimed, the track log must show one of the following:

a. At least one point inside the cylinder for “Enter” cylinders, or at least one point outside the cylinder for “Exit” cylinders.
b. A pair of consecutive points (in a continuous tracklog) whose connecting line passes through the cylinder.

7.3.4.2 CIVL

The pilot’s tracklog must contain a crossing of either the turnpoint cylinder tolerance zone’s inner or outer boundary, indicated by one of the following:

a. a point inside and a subsequent point outside that boundary
b. a point outside and a subsequent point inside that boundary

7.3.4.3 Proposal 1.13

The pilot’s tracklog must contain a crossing of either the turnpoint cylinder tolerance zone’s inner or outer boundary, indicated by one of the following:

- a point inside and a subsequent point outside that boundary
- a point outside and a subsequent point inside that boundary

This definition reflects more accurately how scoring software systems determine whether a turnpoint has been reached. This is also connected to 7.2.3 P1.5: Control zone definition.

7.4 Task Validity

7.4.1 P1.14: Launch Validity

7.4.1.1 PWCA

1. LVR = min(1, (NumberOfPilotsFlying + Nominal Launch) / NumberOfPilotsPresent)
2. LaunchValidity = 0.028 * LVR + 2.917 * LVR^2 - 1.944*LVR^3

7.4.1.2 CIVL

1. LVR = min(1, NumberOfPilotsFlying / (NumberOfPilotsPresent * NominalLaunch)
2. LaunchValidity = 0.027 * LVR + 2.917 * LVR^2 - 1.944*LVR^3

7.4.1.3 Proposal 1.14

1. LVR = min(1, NumberOfPilotsFlying / (NumberOfPilotsPresent * NominalLaunch)
2. LaunchValidity = 0.028 * LVR + 2.917 * LVR^2 - 1.944*LVR^3

LVR: This reflects the use of a percentage for the Nominal Launch parameter (see 7.1.1 P1.1: Nominal Launch)

Launch validity: The difference of the first coefficient goes back to a typo in the 2014 version of the document that eventually became S7F. Historically, and in the software, it was always 0.028.

7.4.2 P1.15: Distance Validity

7.4.2.1 PWCA

NomDistArea = ((NomGoal + 1) * (NomDist - MinDist) * NomGoal * (BestDist - NomDist))/2

7.4.2.2 CIVL

NomDistArea = ((NomGoal + 1) * (NomDist - MinDist) + max(0, NomGoal * (BestDist - NomDist)))/2

7.4.2.3 Proposal 1.15

NomDistArea = ((NomGoal + 1) * (NomDist - MinDist) + max(0, NomGoal * (BestDist - NomDist)))/2

The PWCA version contains a typo (multiplication instead of sum) and does not protect from negative numbers in the case where Best Distance is smaller than Nominal Distance.

7.5 Points allocation

7.5.1 P1.16: Goal Ratio

Goal Ratio determines the distribution between Distance, Time, and Leading Points.

7.5.1.1 PWCA

GoalRatio = NumberOfPilotsInGoalWithTimePoints / NumberOfPilotsFlying

7.5.1.2 CIVL

GoalRatio = NumberOfPilotsInGoal / NumberOfPilotsFlying

7.5.1.3 Proposal 1.16

GoalRatio = NumberOfPilotsInGoal / NumberOfPilotsFlying

CIVL's version favours pilots reaching goal in time for time points, as late arrivals still increase Goal Ratio, leading to more Time and Leading Points but fewer Distance Points. PWCA's version benefits late pilots by excluding them from Goal Ratio, resulting in more Distance Points. We recommend the CIVL version for simplicity and because it prioritizes faster pilots' interests.

7.5.2 P1.17: Distance Weight

7.5.2.1 PWCA

DistanceWeight = 0.9 - 1.67 * GoalRatio + 1.71 * GoalRatio^2 - 0.59 * GoalRatio^3

7.5.2.2 CIVL

DistanceWeight = 0.9 - 1.665 * GoalRatio + 1.713 * GoalRatio^2 - 0.587 * GoalRatio^3

7.5.2.3 Proposal 1.17

DistanceWeight = 0.9 - 1.665 * GoalRatio + 1.713 * GoalRatio^2 - 0.587 * GoalRatio^3

While the coefficients in this formula changed in the PWCA rules of 2023, a results comparison showed that this change was never implemented in CompCheck. Therefore, we stay with the original values.

7.5.3 P1.18: Leading Weight – amended

This determines the distribution of a task's non-Distance Points between Leading and Time Points.

7.5.3.1 PWCA

LeadingWeight = (1 – DistanceWeight) / (GoalRatio = 0 : 1 : 3.8)

7.5.3.2 CIVL

Leading Weight Factor is a parameter to be set by the task setters for each task, between 0% and 50%. The default is 26%.

LeadingWeight = (1 – DistanceWeight) * LeadingWeightFactor

7.5.3.3 Proposal 1.18

Leading Weight Factor is a parameter to be set by the task setters for each task, between 0% and 26%. The default is 26%.

LeadingWeight = (1 – DistanceWeight) * LeadingWeightFactor

This combines CIVL's flexibility with the thought within the PWCA that the Leading Weight should never be more than 26%.

7.5.4 P1.19: Available points

The available Distance, Leading and Time Points are calculated based on the previously calculated values for Task Validity, Distance Weight and Leading Weight.

7.5.4.1 PWCA

AvailableDistancePoints = 1000 * DistanceWeight
AvailableLeadingPoints = 1000 * LeadingWeight
AvailableTimePoints = 1000 – AvailableDistancePoints – AvailableLeadingPoints

7.5.4.2 CIVL

TimeWeight = 1 – DistanceWeight – LeadingWeight

AvailableDistancePoints = 1000 * TaskValidity * DistanceWeight
AvailableLeadingPoints = 1000 * TaskValidity * LeadingWeight
AvailableTimePoints = 1000 * TaskValidity * TimeWeight

7.5.4.3 Proposal 1.19

TimeWeight = 1 – DistanceWeight – LeadingWeight

AvailableDistancePoints = 1000 * TaskValidity * DistanceWeight
AvailableLeadingPoints = 1000 * TaskValidity * LeadingWeight
AvailableTimePoints = 1000 * TaskValidity * TimeWeight

The PWCA rules omit task validity, but this is an error. The intention has always been to use task validity to devalue available points, as per GAP's core principle. Fortunately, CompCheck implemented this correctly.

7.6 Pilot score

7.6.1 P1.20: Beginning of the Time-Distance graph

Each started pilot's track log is used to calculate the Leading Coefficient (LC), by evaluating the area underneath a graph defined by each track point's time, and the distance to ESS at that time.

7.6.1.1 PWCA

The times used for this calculation are given in seconds from the moment when the first pilot crossed SSS, to the time when the last pilot reached ESS.

7.6.1.2 CIVL

The times used for this calculation are given in seconds from the first start gate time (as defined for the task), to the time when the last pilot reached ESS.

7.6.1.3 Proposal 1.20

The times used for this calculation are given in seconds from the first start gate time (as defined for the task), to the time when the last pilot reached ESS.

This change was introduced by CIVL in 2021. It streamlines the process of Leading Coefficient calculation, and by that facilitates live scoring. Starting at the first start time instead of when the first pilot started affects pilots' scores only minimally, if at all.

7.6.2 P1.21: Leading Coefficient calculation

To calculate pilots' Leading Points, the Leading Coefficient LC is calculated for each pilot, based on their tracklog. The PWCA introduced a new way to do this calculation in 2021, and this was adopted by CIVL in 2022. In 2023, the PWCA refined the new calculation, to reduce the Leading Points drop-off for pilots who landed out. This refinement has yet to be adopted by CIVL.

$$LC_p = \frac{leadingArea_p + missingArea_p}{1800 * speedSectionDistance}$$

$$done(p) = 1 - (\text{minToEss}(p))/speedSectionDistance$$

$$\text{weight}(v) = \text{weightRising}(1 - v) * \text{weightFalling}(1 - v)$$

$$\text{weightRising}(w) = (1 - 10^{9*v-9})^5$$

$$\text{weightFalling}(w) = (1 - 10^{-3*v})^2$$

7.6.2.1 PWCA

$$leadingArea_p = \sum_{\forall i: tp_i \in trackPointsInSS_p} \text{minToESS}(tp_i) * \text{taskTime}(tp_i) * \int_{done(tp_{i-1})}^{done(tp_i)} \text{weight(x)}\, dx$$

$$missingArea_p = \text{minToESS}(bestTrackPoint_p) * \text{maxTime} * \int_{done(bestTrackPoint_p)}^{1} \text{weight(x)}\, dx$$

7.6.2.2 CIVL

$$leadingArea_p = \sum_{\forall i: tp_i \in trackPointsInSS_p} \text{weight}(\text{done}(tp_i)) * (\text{minToESS}(tp_{i-1}) - \text{minToESS}(tp_i)) * \text{taskTime}(tp_i)$$

$$missingArea_p = \text{weightFalling}(1 - \text{done}(bestTrackPoint_p)) * (maxTime - firstTaskStartTime) * \text{distToESS}(bestTrackPoint_p)$$

7.6.2.3 Proposal 1.21

$$leadingArea_p = \sum_{\forall i: tp_i \in trackPointsInSS_p} \text{minToESS}(tp_i) * \text{taskTime}(tp_i) * \int_{done(tp_{i-1})}^{done(tp_i)} \text{weight(x)}\, dx$$

$$missingArea_p = \text{minToESS}(bestTrackPoint_p) * \text{maxTime} * \int_{done(bestTrackPoint_p)}^{1} \text{weight(x)}\, dx$$

This leverages the PWCA's work to improve LC calculation and reduce the Leading Points drop-off for pilots who land out.

7.7 Stopped task

7.7.1 P1.22: Minimum Time – amended

The Minimum Time parameter sets the shortest duration a task must run to be eligible for scoring. Tasks stopped before this threshold are not scored.

7.7.1.1 PWCA

~~For a stopped task to be scored the Task Stop Time must be at least one hour after the start for Race to Goal, or one hour after the Last Start Time for all other race types.~~

According to the (not yet published) PWCA rules 2025: A stopped task counts for the competition results if its Task Validity is 0.05 or more.

7.7.1.2 CIVL

Stopped tasks will be scored only if they ran for a sufficiently long time.

$$minimumTime = \min\left(1h, \frac{NominalTime}{2}\right)$$

7.7.1.3 Proposal 1.22

In paragliding, a stopped task only counts for the competition results if its Task Validity is 0.05 or more.

~~Stopped tasks will be scored only if they ran for a sufficiently long time.~~

~~$minimumTime = \min\left(1h, \frac{NominalTime}{2}\right)$~~

~~CIVL's 2020 decision adjusted minimum time for stopped tasks for shorter competitions, setting it to half the nominal time, with a 1-hour cap. The change ensures fair scoring across a wide range of task durations, particularly benefiting competitions expecting shorter flights.~~

~~See also 8.4.1 P2.9: Minimum Task Time.~~

7.7.2 P1.23: Bonus Distance

The Bonus Distance is calculated for pilots in stopped tasks. If this leads to a bigger distance than the actual distance that they had flown up to the stop time, then they are scored for their Bonus Distance instead.

7.7.2.1 PWCA

While not explicitly stated in the rules, at least CompCheck performs the Bonus Distance calculation for all pilots, regardless of landed or flying at the task stop time, and then uses their bonus distance if it exceeds the flown distance.

7.7.2.2 CIVL

Also, while not explicitly stated in the rules, at least FS and AirScore, for their GAP implementations, perform the Bonus Distance calculation only for pilots still flying at the task stop time, and use their Bonus Distance if it exceeds the flown distance. Pilots who already landed before the task stop time are not awarded a bonus distance.

7.7.2.3 Proposal 1.23

Bonus distance is only awarded to pilots still flying at the task stop time.

This is in accordance with the intended purpose of this bonus distance: To provide an advantage to pilot A who at the stop time was flying high above pilot B who had already landed some time previously.

See also 8.4.2 P2.10: Altitude Bonus

7.7.3 P1.24: Bonus Glide Ratio – amended

7.7.3.1 PWCA

According to the (not yet published) PWCA rules 2025: The Bonus Glide Ratio is defined as 2.5.

7.7.3.2 CIVL

The Bonus Glide Ratio for paragliding is defined as 4.0.

7.7.3.3 Proposal 1.24 – amended

The Bonus Glide Ratio for paragliding is defined as 2.5.

7.8 Competition ranking

7.8.1 P1.24: Decimals in competition results

7.8.1.1 PWCA

While not explicitly stated in the PWCA rules, competition results are given with one decimal place.

7.8.1.2 CIVL

While also not explicitly stated in S7F, nor in the references S7A, competition results are rounded to whole numbers.

7.8.1.3 Proposal 1.25

Competition results are given with one decimal place.

7.8.2 P1.26: FTV factor

The FTV factor decides which part of a pilot's task scores is discarded and does not count towards their competition score.

7.8.2.1 PWCA

The FTV "reject rate" is set to 25%.

7.8.2.2 CIVL

For competitions with up to 6 planned tasks, an FTV factor of 0.2 is used. For competitions with 7 or more planned tasks, an FTV factor of 0.25 is used.

7.8.2.3 Proposal 1.26

In paragliding, the FTV factor is 25%. Organizers of FAI Category 2 and of unsanctioned events can set any value adequate for their competition.

An FTV factor of 25% is the de facto standard in paragliding competitions and should be used in FAI Category 1 events. However, organizers may adjust this value for other competitions, particularly those spanning multiple events in a season.

8 Proposal 2: Unified scoring formula improvements

This section proposes 12 improvements and changes to the unified scoring formula that results from the section 7, as outlined in Table 3. These improvements are presented as sub-proposals, identified as “P2.x”.

Main topic	Improvement
Competition parameters	1. Fixed value for Nominal Launch (8.1.1) 2. Fixed value for Nominal Goal (8.1.2)
Task definition	3. Control zones (8.2.1) 4. Race type names (8.2.2) 5. Define projection algorithms for plana calculations (8.2.3) 6. Define algorithm for route optimization (8.2.4)
Flight evaluation	7. Define algorithm for geodesic calculations (8.3.1) 8. Reduce turnpoint tolerance (8.3.2)
Stopped task	9. Minimum Task Time (8.4.1) 10. Altitude Bonus (8.4.2) 11. Bonus Glide Ratio (8.4.3)
General	12. Naming (8.5.1)

Table 3: Overview of the proposed scoring formula improvements

8.1 Competition parameters

8.1.1 P2.1: Fixed value for Nominal Launch – amended

Nominal Launch is a fixed value of 96% and cannot be changed.

Experience shows organizers rarely change this parameter. Following PWCA's example, a fixed value works effectively. This approach simplifies competition management while maintaining consistency across events.

8.1.2 P2.2: Fixed value for Nominal Goal

Nominal Goal is a fixed value of 30% and cannot be changed.

Organizers rarely alter this parameter due to its minimal, complex impact on scores. The default 30% works well for all competitions.

8.2 Task definition

8.2.1 P2.3: Control zones – withdrawn

~~The only control zone type is the Circle.~~

~~We propose replacing the Goal Semi-circle and Goal Line with a circular goal for several reasons:~~

1. ~~Tracklogs and ESS have made traditional goal lines obsolete.~~
2. ~~Goal lines often misalign with actual flight paths, especially in challenging conditions.~~
3. ~~Circular goals can be evaluated consistently with other turnpoints, including tolerances.~~
4. ~~Landing guidance can be achieved through clear ground markings and small goal cylinders.~~

~~This change simplifies goal verification, aligns with modern tracking technology, and provides flexibility for various landing approaches while maintaining the ability to guide pilots to appropriate landing areas.~~

8.2.2 P2.4: Race type names – amended

- Rename “Race to goal” to “Race” (and consequently, “Race to goal with multiple start gates” to “Race with multiple start gates”).
- Rename “Elapsed time” to “Time Trial”.

The name “race to goal”, strictly speaking, does not contain any information, since all our tasks are races where pilots fly towards a goal. The term “Elapsed time” does not convey the purpose of the task, whereas the term “Time Trial” is used in many sports for individually timed tasks.

8.2.3 P2.5: Define projection algorithms for planar calculations

1. To convert WGS84 spheroid coordinates to planar coordinates and back, a Localized Transverse Mercator (LTM) projection with adjusted scaling is applied.
2. To find the centre point of the projection, the following procedure is followed:
    1. Find bounding box B1 containing all turnpoint centres used in the task definition
    2. Centre point C1 is the centre of B1
    3. Use the LTM projection based on C1 to find planar representation P1 of the task
    4. Find the optimal route for P1, with R1 containing all optimized route points
    5. Convert all points in R1 back to WGS84 points R1’
    6. Find bounding box B2 containing all points in R1’
    7. Centre point C2 is the centre of B2
    8. Use the LTM projection based on C2 for all conversions between WGS84 and planar coordinates when scoring a task
3. The centre point’s longitude serves as the centre meridian for the transformation to planar coordinates.
4. When transforming planar coordinates to WGS84 coordinates, the scaling factor is calculated as follows[1] from the centre point’s latitude *C.lat*:

$$scaling = \begin{cases} clat \leq 55°: 0.99994 \\ clat > 55°: 0.99994 + \dfrac{clat - 55}{60} * 1.3 * 10^{-4} \end{cases}$$

Route optimization, as applied when calculating task and speed-section distance, as well as when evaluating pilots’ tracklogs, must be done in a plane. This requires a conversion of the turnpoint and tracklog WGS84 coordinates to planar coordinates, and – in the case of task distance – back to WGS84 coordinates.

Until now, the exact algorithm for this conversion was undefined. This can be remedied by the definition above. Following this procedure ensures high accuracy for task distances and flown distances, regardless of latitude.

An implementation of this LTM with adjusted scaling can be found in the free and widely recognized library PROJ[2].

8.2.4 P2.6: Define algorithm for route optimization

To find the shortest route along a task, the algorithm presented in Ding et al. (2018)[3] (we name it “CircleTour” for the rest of this document) is applied as follows:

[1] According to Daniel Dimov, Java class CoordinateConverter, 2023
[2] https://proj.org/
[3] Ding, Xie, Jiang, An Efficient Algorithm for Touring n Circles, EITCE 2018. Download here: https://www.matec-conferences.org/articles/matecconf/pdf/2018/91/matecconf_eitce2018_03027.pdf

1. Apply CircleTour on circle sequence O1, which includes all turnpoints up to and including ESS, with starting point s1 being the launch point, and the centre of ESS being the ending point t1. This yields a set of route points R1 = {s1, r1.1, r1.2, …, r1.n, t1}.
2. Apply CircleTour on circle sequence O2, which includes all turnpoints following ESS, as well as goal, with r1.n from the previous step being starting point s2, and the centre of goal being the ending point t2. This yields a set of route points R2 = {s2, r2.1, r2.2, …, r2.n, t2}.
3. The optimized task route is then R = {s1, r1.1, r1.2, …, r1.n, r2.1, r2.2, …, r2.n}

Since 2020, S7F includes a shortest route algorithm for tasks. However, adopting CircleTour, a proven algorithm from published literature, offers clarity and simplification. This aligns well with the proposal to limit control zones to circles (see 8.2.1 P2.3: Control zones), further streamlining the process.

8.3 Flight evaluation

8.3.1 P2.7: Define algorithm for geodesic calculations – amended

For all geodesic calculations on the WGS84 ellipsoid done for scoring a task, we use a distance calculation that is based on a custom implementation which incorporates elements similar to those found in Vincenty's formulae. The method involves transformations typical of geodesic problems on an ellipsoid, including the use of reduced latitudes and trigonometric functions to compute the distance between two points on the WGS84 ellipsoid. Sample code is provided in the scoring formula documentation.

Instrument manufacturers are free to choose alternative algorithms as they see fit for the specifics of their devices, understanding that in the end, the tracklog will be evaluated using the highly accurate Thomas algorithm.

This standardization will improve scoring accuracy and comparability across competitions.

8.3.2 P2.8: Reduce Turnpoint Tolerance – amended

1. The Turnpoint Tolerance is 5 m.

We propose reducing turnpoint tolerance. This change aims to:

1. Discourage pilots from intentionally turning early within the tolerance zone
2. Reduce potentially dangerous situations caused by unexpected early turns
3. Align with improved GPS accuracy in modern navigation devices

While this may initially result in some missed turnpoints, pilots are expected to adapt quickly. The reduced tolerance still accounts for technical discrepancies between navigation instruments and scoring software.

The reduced tolerance may increase cases where a pilot's navigation device shows turnpoint achievement while their live tracker records a position outside the cylinder’s tolerance zone, due to GPS discrepancies. Affected pilots can resolve this by submitting backup tracklogs from their navigation instruments, verifying correct turnpoint achievement and allowing for appropriate score adjustments. This existing resolution process ensures fair scoring despite the potential increase in such discrepancies.

This change balances safety, fairness, and technological advancements in GPS accuracy.

8.4 Stopped task

8.4.1 P2.9: Minimum Task Time – withdrawn

~~This proposal has two variations. We propose 2.10A, understanding that the same proposal was already discussed and only partially adopted at the 2020 CIVL Plenary. If 2.10.A is not accepted, then we propose 2.10.B, as a general improvement of the current situation.~~

~~8.4.1.1 P2.9.A: Remove Minimum Task Time~~

~~No minimum time is required for scoring a stopped task.~~

~~We propose eliminating the minimum time requirement for stopped tasks and allowing GAP's inherent devaluation mechanism to determine task validity. This approach offers several advantages:~~

1. ~~Removes the hard threshold that creates a dilemma for race directors between safety and task validity.~~
2. ~~Provides a smooth transition in task validity as task duration increases.~~
3. ~~Aligns with GAP's design principles of avoiding abrupt changes in scoring.~~

~~For stopped tasks lasting only a short duration:~~

- ~~Time Validity and Distance Validity will naturally be low.~~
- ~~Stop Validity will reflect the task's incomplete state.~~
- ~~Total task validity will gradually increase with task duration.~~

~~While this approach may slightly increase the number of counting tasks for some competitions, the benefit of allowing race directors to prioritize safety without compromising task validity outweighs potential minor distortions in the WPRS.~~

~~8.4.1.2 P2.9.B: Minimum Task Time affects Stop Validity~~

$$taskDuration = taskStopTime - \max(\forall p \in StartedPilots: startTime_p)$$

$$StopValidity = max\left(0, \frac{taskDuration - minTaskTime}{\max(1, abs(taskDuration - minTaskTime))}\right) * min(1, NumberOfPilotsReachedESS + \sqrt{\frac{BestDistFlown - avg(\forall i: DistFlown_i)}{DistLaunchToESS - BestDistFlown + 1}} * \sqrt{\frac{stdev(\forall i: DistFlown_i)}{5}} + \left(\frac{NumPilotsLandedBeforeStopTime}{NumPilotsLaunched}\right)^3)$$

~~We propose revising the Stop Validity formula to integrate the Minimum Time concept, rather than overriding Task Validity calculations. This approach:~~

1. ~~Maintains consistency with the general Task Validity formula (Launch Validity * Distance Validity * Time Validity * Stop Validity).~~
2. ~~Eliminates the need for a separate rule to set Task Validity to 0 for tasks shorter than Minimum Time.~~
3. ~~Ensures Stop Validity becomes 0 when task time is below Minimum Time.~~

~~This change aligns the handling of short tasks with GAP's overall design principles, providing a more coherent and flexible scoring system.~~

8.4.2 P2.10: Altitude Bonus

When a task is stopped, an Altitude Bonus is calculated for pilots still airborne:

1. Altitude above goal at Task Stop Time is determined

2. This altitude is multiplied by a Bonus Glide Ratio
3. Resulting Altitude Bonus is added to the distance covered at that point

The Bonus Distance (distance at stop + Altitude Bonus) is used for Distance Points calculations if it exceeds the pilot's best distance up to Task Stop Time. This applies to hang-gliding's difficulty calculations as well. Time and Leading Point calculations remain unaffected by these bonuses.

This method compensates for altitude differences at task stoppage, ensuring fair scoring for all pilots.

We propose applying the Altitude Bonus only to each pilot's last counting tracklog point at Task Stop Time. This change:

1. Rewards pilots flying higher at task stoppage
2. Bases scoring on actual pilot decisions documented in tracklogs
3. Eliminates hypothetical "could have, should have" scenarios

The current method of applying Altitude Bonus to the entire tracklog can lead to unrealistic scoring based on earlier, potentially more favourable positions. Our proposal ensures scoring reflects pilots' actual choices and positions at Task Stop Time, rather than hypothetical outcomes from earlier in the flight.

This approach aligns scoring more closely with pilots' real-time decision-making and actual flight paths.

8.4.3 P2.11: Bonus Glide Ratio – added

In paragliding, the bonus glide ratio is 0.

This is to discourage pilots from climbing just before an imminent task stop and thereby endangering themselves.

8.5 General

8.5.1 P2.12: Naming and versioning – moved

We propose renaming the unified scoring formula to reflect the CIVL-PWCA collaboration and acknowledge its evolution beyond the original GAP creators. The new name should honour the formula's origins by being close to its original, while allowing for version updates independent of calendar years.

Name: GAP_2025_ _

Version number: single number, increments by 1.

Examples: GAP_2025.1, GAP_2025.2

9 Proposal 3: Unification of hang-gliding and paragliding racing scoring

This section outlines 8 key differences between hang-gliding and paragliding scoring formulas, as outlined in Table 4. It aims to:

1. Provide a comprehensive comparison
2. Initiate objective discussion on sportive merits
3. Offer simplification suggestions (sub-proposals P3.x)

Main topic	Differences
Pilot score	1. Arrival Points (9.1) 2. Distance Points (9.2) 3. Leading Coefficient (9.3) 4. Starting before the first Start Gate (9.4) 5. Validation of Speed Section Time (9.5)
Stopped task	6. Score-back Time (9.6) 7. Bonus Glide Ratio (9.7)
Competition results	8. Discards in competition scores (9.8)

Table 4: Overview of the differences between hang-gliding and paragliding scoring

Sub-proposals reflect an avid observer's perspective, not that of an active hang-gliding competitor. The goal is to:

- Potentially reduce differences for easier formula maintenance
- Or confirm the distinct nature of the two involved disciplines if differences remain justified

This process will refine the scoring formula to better reflect each sport's unique characteristics.

9.1 Arrival Points

Arrival Points were initially introduced in GAP to encourage early starts in hang-gliding Multi-Start Races. However, they proved less effective than intended, leading to the introduction of Leading Points. Over time, it became clear that:

1. Arrival and Leading Points serve similar purposes
2. Leading Points influence task ranking, while Arrival Points do not
3. Distributing points as Leading and Time Points is sufficient and simpler

Consequently, Arrival Points have been phased out in hang-glider classes 2 (Swift & Archeopteryx, since 2023) and 3 (paragliders, since 2014). This change simplifies scoring while maintaining incentives for strategic race performance.

9.1.1 P3.1: Retire Arrival Points – withdrawn

The proposal is withdrawn upon request from the hang-gliding committee. They will discuss it throughout the year, and if appropriate, will propose the change at the 2026 Plenary.

~~For all classes: A pilot's task score is the sum of their Distance, Leading, and Time Points.~~

~~For the points distribution resulting from this change, see 7.5 Points allocation.~~

9.2 Distance Points

GAP's Distance Points system originally aimed to influence pilot behaviour through a difficulty calculation based on landing patterns. However, this approach had unintended consequences:

1. It rewarded overflying larger groups, contrary to its intent
2. Its impact on pilot behaviour was likely overestimated
3. Over time, its influence was reduced to 50%, with the other 50% awarded linearly

Since 2013 (PWCA) and 2014 (CIVL), paragliding competitions have abandoned the difficulty calculation, adopting a purely linear distance-based point system. This change has not led to an increase in reckless behaviour, suggesting that the complexity of the original system may have been unnecessary.

9.2.1 P3.2: Linear distribution of Distance Points – withdrawn

The proposal is withdrawn upon request from the hang-gliding committee. They will discuss it throughout the year, and if appropriate, will propose the change at the 2026 Plenary.

~~For all classes: The available distance points are assigned to each pilot linearly, based on the pilot's distance flown in relation to the best distance flown in the task.~~

9.3 Leading Coefficient

The Leading Coefficient (LC) is a measure of a pilot's progress towards the goal throughout a task. Its calculation has evolved to address issues in scoring:

1. Initially, LC was uniform throughout the task, creating a correlation between Leading and Time Points.
2. In 2012 (PWCA), 2014 (CIVL PG) and 2015 (CIVL HG), LC calculation was modified to heavily reward early progress, and massively reducing Leading Points gains towards the end of the Speed Section (Figure 5).
3. This change unintentionally rewarded high starts, leading to aggressive pre-start flying and cloud-flying incidents.
4. PWCA introduced a new LC calculation in 2019, refined in 2023, which CIVL adopted for paragliding in 2020 (2023 refinement pending for 2025). This method rewards progress mainly between 10% and 80% of Speed Section distance (Figure 6).

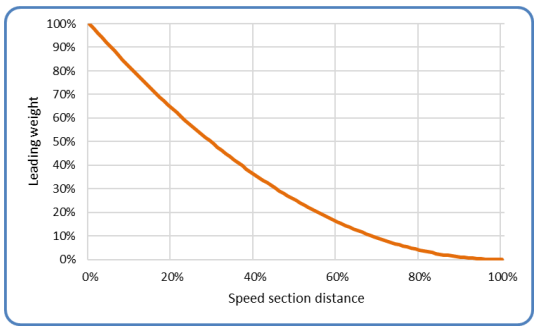

Figure 5: LC weight distribution introduced in 2012-2015

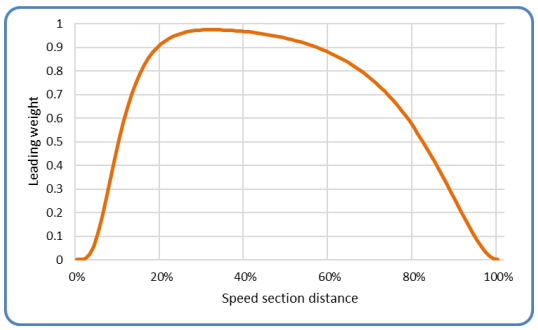

Figure 6: LC weight distribution used in PG since 2019

9.3.1 P3.3: LC weight distribution – withdrawn

The proposal is withdrawn upon request from the hang-gliding committee. They will discuss it throughout the year, and if appropriate, will propose the change at the 2026 Plenary.

~~All disciplines use the Leading Coefficient weight distribution introduced by the PWCA in 2023.~~

~~This proposed LC calculation aims to balance fair scoring with safe flying practices.~~

9.4 Starting before the first Start Gate

Hang-gliding and paragliding currently handle early starts differently:

1. Hang-gliding:
    a. Uses a "Jump-the-gun" penalty
    b. Early starts are scored, but with reduced points
2. Paragliding:
    a. Early start cylinder crossings are invalid
    b. Only crossings after the start gate are considered

9.4.1 P3.4: Start cylinder crossings before first Start Gate – withdrawn

The proposal is withdrawn upon request from the hang-gliding committee. They will discuss it throughout the year, and if appropriate, will propose the change at the 2026 Plenary.

~~All start cylinder crossings before the first Start Gate open time are invalid. There is no "Jump-the-Gun" Penalty.~~

~~We propose simplifying hang-gliding start procedures:~~

- ~~Only count start cylinder crossings after first start gate~~
- ~~Pilots still score based on their valid crossings~~

~~Rationale:~~

1. ~~Simplifies scoring process~~
2. ~~Maintains educational effect on pilots~~
3. ~~Early starts typically occur only once, early in a pilots' careers~~

~~Addressing concerns:~~

- ~~For pilots potentially blown out of start cylinder, set earlier start gates~~

~~This change streamlines scoring while maintaining fair competition and adapting to current technology.~~

9.5 Reaching ESS but not goal

Hang-gliding and paragliding handle Time Points differently for pilots landing between ESS and goal:

1. Hang-gliding (since 2008): Awards 80% of Time Points to pilots landing between ESS and goal
2. Paragliding: Time Points are awarded only if goal is reached

We propose reconsidering the hang-gliding approach:

1. Current situation:
    a. Partial Time Points can occasionally lead to task wins
    b. Landing short is generally not strategy for winning a competition
2. Considerations:
    a. Other air sports (e.g. sailplane racing) don't award partial Time/Speed Points
    b. Top pilots often separated by small margins
    c. Partial points may reduce separation between pilots
3. Question to consider:
    a. Does awarding partial Time Points serve a sportive purpose, or merely soften disappointment?

9.5.1 P3.5: Validation of Speed Section Time – withdrawn

The proposal is withdrawn upon request from the hang-gliding committee. They will discuss it throughout the year, and if appropriate, will propose the change at the 2026 Plenary.

~~To validate their Speed Section Time and receive the corresponding Time Points, pilots must reach goal.~~

~~To reduce the negative effects of landing short, consider introducing discards for competition results (see 9.8).~~

9.6 Score-back Time

In hang-gliding, stopped tasks are “scored back” by a time that is determined by the number of start gates and the start gate interval: The task stop time is one start gate interval, or 15 minutes in case of a single start gate, before the task stop announcement time.

This puts the time until which the task is scored quite a bit away from when the stop was announced, making the result seemingly even more random. According to our observations, a uniform Score-back Time of 5 minutes will work just as well, if not better.

9.6.1 P3.6: Score-back Time is 15 minutes – updated

The proposal is updated upon request from the hang-gliding committee.

The Score-back Time is always 15 minutes.

9.7 Bonus Glide Ratio

Hang-gliding uses a Bonus Glide Ratio of 5 for Altitude Bonus Distance calculations, while paragliding uses 4. This difference is noted for completeness, but no change is proposed.

9.7.1 P3.7: Bonus Glide Ratio remains unchanged

$$BonusGlideRatio_{HG} = 5.0$$

9.8 Discards in competition scores

Hang-gliding and paragliding competitions differ in their use of discards:

1. Hang-gliding:
    a. All tasks count towards competition scores
    b. No discards used
2. Paragliding:
    a. Discards used in competition series since late 1990s
    b. Discards used in individual competitions since 2009

This difference is noted to ensure the continued non-use of discards in hang-gliding is a deliberate choice, not an oversight

9.8.1 P3.8: Discard factor remains unchanged

$$FTV\_factor_{HG} = 0$$

10 Suggestion: Future racing scoring formula development

To ensure the ongoing joint development of the unified racing scoring formula proposed above, additional steps are required. Here we give a rough outline of how PWCA and CIVL could collaborate to achieve this. The final decision and detailed processes will be up to the PWCA Committee and CIVL Bureau to decide.

1. Create a joint working group, consisting of 3-5 scoring experts familiar with hang-gliding and paragliding, representing both CIVL and PWCA.
2. The working group defines new formula versions as often as necessary, but as rarely as possible, based on input from CIVL and PWCA.
3. PWCA and CIVL independently decide which version to use for each season and/or competition.
4. The working group can define experimental formula versions, to evaluate new concepts before bringing them into the main formula. Experimental formulas must not be adopted by PWCA or CIVL for their main competitions.

Final implementation details to be determined by PWCA Committee and CIVL Bureau.