

MCMS Algorithms

MCMS Grading Algorithm - Detailed Specification

1. Scores to be considered

- 1.1. All scores recorded in the MCMS system since the 1st of January 2021 will be considered for grading purposes. Scores are considered regardless of whether the shooter was competing for prizes or shooting “clays only”.
- 1.2. It is scores that are to be used for grading purposes. This means additional information such as “broken targets” for point score events will not be referenced.

2. Scores to be excluded

- 2.1. Any scores from a program which has a status of Private, Cancelled or Under Construction will be excluded from grading calculations.
- 2.2. Any scores from an event marked as “Novelty / Unofficial” will be excluded from grading calculations.
- 2.3. Any scores not recorded as part of an “event” will be excluded from grading calculations. This means shoot-off scores will be excluded.
- 2.4. Any scores where the number of targets shot at are less than the minimum specified in the algorithm parameters for the skill the score is recorded for will be excluded from grading calculations.
- 2.5. Any scores from an event tagged with a parameter that has been specified as “to be excluded” for that skill will be excluded from grading calculations. For example, “graded meterage” within DB, SB and PS in the Trap discipline.

3. Scores to be converted to percentages and then those percentages to be averaged

- 3.1. Any scores forming part of a shooter’s grade calculation will be converted to a percentage by dividing the score by the possible.
- 3.2. Once the percentage has been identified it will be uplifted if necessary, by the appropriate difficulty factor(s).
- 3.3. All the identified (and uplifted where appropriate) percentages will then be averaged to identify the shooter’s percentage for a particular skill which will then be compared to the cut-offs for that skill to identify the shooter’s grade for that skill.

4. Percentages Cut-offs for Grading and elimination of non-indicative scores

- 4.1. Each skill will have a cut-off percentage parameter for each published grade (AA, A, B and C).
- 4.2. Each skill will also have a cut-off percentage parameter for two further unpublished grades (D and E) to facilitate the non-discretionary elimination of non-indicative scores.

5. Shooter's "Anchor" (long term) grade calculation

- 5.1. All considered and non-excluded scores for a shooter will be identified. Any scores with an adjusted percentage lower than the "E Grade" cut-off will be excluded as non-indicative (subject to the "new shooter" adjustment specified in section 9 below).
- 5.2. The shooter's most recent 50 scores will be identified. The best 25 adjusted percentages within these 50 scores will then be identified. The identified percentages will then be averaged and the result compared against the relevant skill cut-offs to identify the shooter's "Anchor" grade.
- 5.3. Where 50 scores are not available the "best" scores will be pro-rata'd accordingly by rounding up. For example, if only 29 are available then the best 15 would be averaged.
- 5.4. The 50 and 25 values as specified above are configurable parameters within the system.
- 5.5. Once a shooter has 50 scores available any new score received that meets the criteria for inclusion will displace the oldest (and lowest) score previously used in the calculation to ensure that the calculation is based on the most appropriate set of scores.
- 5.6. The anchor grade calculation for a particular skill will only trigger once the shooter has had the specified minimum number of scores recorded for them within the MCMS system. Until the minimum number of scores have been recorded the shooter will be regarded as "ungraded" for that skill.

6. Shooter's "Recent" grade calculation

- 6.1. All considered and non-excluded scores for a shooter will be identified. Any scores with an adjusted percentage lower than the cut-off specified for the grade that is two grades below the shooter's Anchor grade will be excluded as non-indicative (subject to the "new shooter" adjustment specified in section 9 below). For example, if a shooter's Anchor grade is "A" then any scores below the "C" grade cut-off will be excluded as below the "floor" and therefore non-indicative.
- 6.2. The shooter's most recent 20 scores will be identified. The best 10 adjusted percentages within these 20 scores will then be identified. The identified percentages will then be averaged and the result compared against the relevant skill cut-offs to identify the shooter's "Recent" grade.
- 6.3. Where 20 scores are not available the "best" scores will be pro-rata'd accordingly. For example, if only 17 are available then the best 9 would be averaged.
- 6.4. The 20 and 10 values as specified above are configurable parameters within the system.

- 6.5. Once a shooter has 20 scores available any new score received that meets the criteria for inclusion will displace the oldest (and lowest) score previously used in the calculation to ensure that the calculation is based on the most appropriate set of scores.
- 6.6. The recent grade calculation for a particular skill will only trigger once the shooter's anchor grade has calculated and the shooter has shot the minimum number of scores above the anchor calculated floor as specified for the particular skill.

7. Shooter's "Skill" grade calculation

- 7.1. The higher of the Shooter's Anchor and Recent grades will be their Skill grade. The minimum Skill grade for competition purposes is C grade even if the calculated percentage is lower.

8. Shooter's "Discipline" grade calculation

- 8.1. The highest of the Shooter's skill grades will be their discipline grade. For example, a Shooter's Trap grade would be the highest of their DB, SB and PS Skill grades. This will be the grade the system assigns the shooter for use in competition. For example, if the shooter's DB grade was A, PS was B and SB was C the shooter's Trap grade would be A and they would compete in A for any DB, PS or SB events within the next competition they nominated for.

9. New Shooter Adjustments

- 9.1. Each skill has a configurable parameter that specifies:
 - The minimum number of scores needed before the grade calculations will be triggered
 - For the Anchor calculation a score is any recorded score no matter the percentage
 - For the Recent calculation a score is any recorded score that exceeds the Anchor floor (ie two grades below the Anchor grade)
 - The minimum number of scores above the "E Grade Floor" before the "Floor" exclusion applies for the Anchor Grade and also before the Recent grade calculation could be triggered (subject to the minimum scores requirement)
- 9.2. Where the number of scores available is less than that specified to trigger an anchor grade calculation then no grade calculation will be performed, and the shooter will be regarded as "ungraded" for that skill. The minimum number of scores specified can be different for each skill within a discipline. For example, Trap DB could have a minimum of 4 but SB could have a minimum of 8.
- 9.3. Where the number of scores shot by the shooter that are above the "E Grade Floor" is less than that specified for the "Floor" exclusion to apply for that skill then all scores for the shooter will be included in the Anchor grade calculation regardless of how low they are.

10. Review Trigger

- 10.1. Every recording of a score in the MCMS system that meets the criteria specified above will trigger a review of the shooter's grade for the relevant skill (and therefore the discipline) that the score relates to.

MCMS Grading Algorithm – Configured Parameters

These parameters have been approved by the ACTA.

1. TRAP

Skills:	Double Barrel (DB) ; Point Score (PS) ; Single Barrel (SB)
Competition Events:	Included: Common Mark
	Excluded: Graded Meterage, Handicap Meterage and Novelty

Difficulty Uplift:	Continental	15m	18m+	20m+	23m+
	3.5%	0.0% _s	2.5%	3.0%	3.5%

Percentage Cut-offs:		AA	A	B	C	D	E
	DB	99.4% (99.5%)	97.0% (97.5%)	93.0% (94.0%)	85.5% (84.0%)	78.0% (72.0%)	70.0% (64.0%)
	PS	97.75% (98.0%)	94.75% (95.5%)	91.0% (91.5%)	84.0% (83.5%)	75.0% (70.0%)	67.0% (63.0%)
	SB	95.5% (96.0%)	91.25% (92.0%)	86.25% (87.5%)	79.0% (80.00%)	72.0% (68.0%)	64.0% (60.0%)

Minimums:		Min Targets for Score to be Included	Minimum Scores for Grade to Calculate	Min Scores for Floor & Recent to Apply
	DB	20	4	6
	PS	20	6	6
	SB	20	8	8

2. DOUBLE RISE

Skills:	Double Rise (DR)	
Competition Events:	Included:	Common Mark
	Excluded:	Novelty

Percentage Cut-offs:		AA	A	B	C	D	E
	DR	89.5% (89.0%)	84.5% (84.0%)	79.0% (78.0%)	73.0% (68.0%)	67.0% (62.0%)	62.0% (56.0%)

Minimums:		Min Targets for Score to be Included	Minimum Scores for Grade to Calculate	Min Scores for Floor & Recent to Apply
	DR	20 (10 PR)	6	6

3. SPORTING

Skills:	Sporting (SP)	
Competition Events:	Included:	Common Mark
	Excluded:	Novelty

Percentage Cut-offs:		AA	A	B	C	D	E
	SP	93.0% (90.0%)	87.0% (83.0%)	80.0% (76.0%)	71.0% (68.0%)	64.0% (60.0%)	55.0% (52.0%)

Minimums:		Min Targets for Score to be Included	Minimum Scores for Grade to Calculate	Min Scores for Floor & Recent to Apply
	SP	20	4	6

4. SKEET SINGLES

Skills:	Skeet Singles (SS)	
Competition Events:	Included:	Common Mark
	Excluded:	Novelty

Difficulty Uplift:	12G : 0.0% ; 20G : 1.0% ; 28G 2.0% ; 410 4.0%
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Percentage Cut-offs:		AA0	A1	B2	B3	C4	C5	D	E
	SS	97.25% (98.0%)	92.0% (94.0%)	89.25% (92.0%)	86.0% (88.0%)	82.5% (84.0%)	76.0% (78.0%)	70.0% (68.0%)	64.0% (60.0%)

Minimums:		Min Targets for Score to be Included	Minimum Scores for Grade to Calculate	Min Scores for Floor & Recent to Apply
	SS	20	4	6

5. SKEET DOUBLES

Skills:	Skeet Doubles (SD)	
Competition Events:	Included:	Common Mark
	Excluded:	Novelty

Difficulty Uplift:	N/A
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Percentage Cut-offs:		AA	A	B	C	D	E
	SD	96.0% (96.5%)	91.0% (93.0%)	85.5% (87.5%)	79.0% (82.0%)	75.0% (66.0%)	66.0% (57.0%)

Minimums:		Min Targets for Score to be Included	Minimum Scores for Grade to Calculate	Min Scores for Floor & Recent to Apply
	SD	20	6	6

6. BALL TRAP

Skills:	Double Barrel (DB)	
Competition Events:	Included:	Common Mark
	Excluded:	Novelty

Percentage Cut-offs:		AA	A	B	C	D	E
	DB	94.0% (92.0%)	89.0% (86.0%)	82.5% (80.0%)	75.0% (72.0%)	67.5% (64.0%)	60.0% (56.0%)

Minimums:		Min Targets for Score to be Included	Minimum Scores for Grade to Calculate	Min Scores for Floor & Recent to Apply
	DB	20	4	6

7. TOWER

Skills:	Double Barrel (DB)	
Competition Events:	Included:	Common Mark
	Excluded:	Novelty

Percentage Cut-offs:		AA	A	B	C	D	E
	DB	98.5% (98.0%)	95.25% (94.0%)	91.5% (88.0%)	84.0% (79.0%)	78.0% (74.0%)	72.0% (69.0%)

Minimums:		Min Targets for Score to be Included	Minimum Scores for Grade to Calculate	Min Scores for Floor & Recent to Apply
	DB	20	4	6

8. ISSF TRAP

Skills:	ISSF Trap (IT)	
Competition Events:	Included:	Common Mark
	Excluded:	Novelty

Percentage Cut-offs:		AA	A	B	C	D	E
	IT	92.5% (92.0%)	86.0% (85.0%)	79.5% (80.0%)	72.0% (72.0%)	65.0% (63.0%)	55.0% (52.0%)

Minimums:		Min Targets for Score to be Included	Minimum Scores for Grade to Calculate	Min Scores for Floor & Recent to Apply
	IT	20	4	6

9. ISSF SKEET

Skills:	ISSF Skeet (IS)	
Competition Events:	Included:	Common Mark
	Excluded:	Novelty

Percentage Cut-offs:		AA	A	B	C	D	E
	IS	93.5% (92.0%)	85.5% (84.0%)	75.0% (74.0%)	68.0% (70.0%)	65.0% (65.0%)	60.0% (60.0%)

Minimums:		Min Targets for Score to be Included	Minimum Scores for Grade to Calculate	Min Scores for Floor & Recent to Apply
	IS	20	4	6

10. UNIVERSAL TRENCH

Skills:	Universal Trench (UT)	
Competition Events:	Included:	Common Mark
	Excluded:	Novelty

Percentage Cut-offs:		AA	A	B	C	D	E
	UT	96.0% (95.0%)	91.0% (90.0%)	86.0% (84.0%)	78.0% (75.0%)	70.0% (64.5%)	60.0% (57.0%)

Minimums:		Min Targets for Score to be Included	Minimum Scores for Grade to Calculate	Min Scores for Floor & Recent to Apply
	UT	20	4	6

11. ALL DISCIPLINES

Calculation Type	Maximum Considered Scores	Maximum Included in "Best of"
Anchor:	50	25
Recent:	20	10

MCMS Handicapping Algorithm - Detailed Specification

1. Scores to be considered

- 1.1. All scores recorded in the MCMS system since the 1st of January 2022 will be considered for handicapping purposes. Scores are considered regardless of whether the shooter was competing for prizes or shooting “clays only”.
- 1.2. It is scores that are to be used for handicapping purposes. This means additional information (eg “wins”) will not be referenced.

2. Scores to be excluded

- 2.1. Any scores from a program which has a status of Private, Cancelled or Under Construction will be excluded from handicapping calculations.
- 2.2. Any scores from an event marked as “Novelty / Unofficial” will be excluded from handicapping calculations.
- 2.3. Any scores not recorded as part of an “event” will be excluded from handicapping calculations. This means shoot-off scores will be excluded.
- 2.4. Any scores where the number of targets shot at are less than the minimum specified in the algorithm parameters will be excluded from handicapping calculations.
- 2.5. Only scores shot double barrel from an event tagged as “Handicap (ACTA Meterage)” will be included, all other scores will be excluded.
- 2.6. Only scores with a time stamp more recent than the timestamp of the shooter’s most recent handicap change will be considered. That is, if a shooter moves from 17m to 18m then only scores after this change will be considered to determine the shooter’s next handicap change.
- 2.7. Only scores where the handicap specified for the shooter in the event is the same as their rounded up handicap at the time will be considered. That is, if the shooter’s handicap is 22m but the administrator nominates them with a handicap of 23m in the event their score will be excluded.

3. Percentages below the “floor”

- 3.1. A “floor” percentage parameter will be configured to facilitate the non-discretionary elimination of non-indicative scores.

4. Starting Handicap

- 4.1. If a shooter has a handicap recorded in the ACTA membership database at the 31st of December 2021 this will be imported into the MCMS system and used as their starting handicap.
- 4.2. If a shooter does not have a handicap recorded in the ACTA membership database at the 31st of December 2021 their starting handicap will be 15m (NB this will be immediately reviewed based on their calculated trap grade).

5. Handicap Review Based on Recorded Scores

- 5.1. Every time a score meeting the criteria specified above is recorded in the MCMS system it will trigger a review of the shooter's handicap.
- 5.2. Firstly, the pool of available scores will be identified:
 - 5.2.1. Only scores since the shooter's last handicap change will be included
 - 5.2.2. Only scores with a percentage greater than the floor will be included
 - 5.2.3. Only scores with a possible greater than the minimum specified will be included
- 5.3. 50T Straight Review
 - 5.3.1. Identify the shooter's most recent score
 - 5.3.2. Identify all scores from the same event as the most recent score and then order them by date and time stamp
 - 5.3.3. Identify sufficient scores starting with the most recent so that the aggregate possible of the identified scores is at least 50 (if this cannot be achieved, eg it is a 40T event, then no action is taken in this step)
 - 5.3.4. Divide the aggregate of the scores themselves by the aggregate possible for the scores identified (eg 25+25 / 25+25)
 - 5.3.5. If the result is **100%** then the shooter's handicap will be **increased by 1m**, if not no review will occur
- 5.4. 150T Review
 - 5.4.1. Starting with the most recent score identify:
 - sufficient scores to achieve an aggregate possible of at least 150 targets
 - where 150 targets are not available no review will occur
 - Sort the identified scores by the highest percentage and starting with the highest percentage score identify sufficient scores to achieve an aggregate possible of at least 100 targets
 - Divide the aggregate of the scores themselves by the aggregate possible for the scores identified
 - 5.4.2. Review the result:
 - If the result is **97% or higher** then the shooter's handicap will be **increased by 1m**
 - if the result is **less than 90%** then the shooter's handicap will **be reduced by 0.5m**
 - if the result is equal to or greater than 90% but less than 97% **no change** will occur to the shooter's handicap

6. Rounding

- 6.1. Where a shooter's handicap is not a whole number their handicap when nominating for an event will be their handicap meterage rounded up (eg 21.5m will shoot off 22m)
- 6.2. Where a shooter's handicap is reviewed and increased, and the result is not a whole number then their new handicap will be rounded up and recorded at the higher number (eg 21.5m will be restated to 22m so any future downgrade would reduce the shooter's handicap to 21.5m)
- 6.3. When identifying the pool of scores for review it is the handicap rounded up meterage that is compared to the meterage the admin nominated the shooter in for the event at that is used (eg 21.5 is rounded to 22m to compare to the 22m the admin nominated the shooter with)

7. Effect of a Trap Grade Change on a Shooter's Handicap

7.1. Reconfirm Shooter's Trap Meterage (Handicap)

- 7.1.1. If a shooter's Trap Grade changes this will trigger a review of their Trap Handicap to reconfirm the appropriate data set and meterage

7.2. Where the **Trap Grade** Change is an "Increase"

- 7.2.1. If the shooter's current handicap (ie before the grade increase) is higher than the benchmark for their grade (before the grade increase)
 - their "**grade downgrade handicap floor**" will be set to their current handicap
 - otherwise, their "grade downgrade handicap floor" will be set to 15
 - ie if shooter is A20 their floor will be set to 20 on a regrade to AA
 - the "grade downgrade handicap floor" is designed to capture any "earned" meters at a lower grade so they are not "lost" on a subsequent grade decrease
- 7.2.2. The shooter's handicap will be updated to the maximum of
 - The shooter's current handicap
 - The benchmark handicap for the shooter's trap grade
 - eg a B18 shooter on a regrade to A would move to A19
 - eg a B20 shooter on a regrade to A would move to A20

7.3. Where the **Trap Grade** Change is a "Decrease"

- 7.3.1. If the shooter has 150T or more in available handicap scores (since last handicap change) then
 - no review action will occur
 - ie shooter has proven they can shoot at their current handicap so they will remain there (see section 5.4, the shooter would have been reviewed and shot between 90-97% and thus "proven" their ability at their current meterage)
- 7.3.2. If the shooter's current handicap is greater than the benchmark handicap
 - for the shooter's grade prior to the downgrade then
 - no handicap review will occur
 - eg if shooter is on 22m & goes from AA to A then no review as 22m is higher than 21m

7.3.3. If the shooter's current handicap is smaller than the shooter's "grade downgrade handicap floor"

- no handicap review will occur
- eg if shooter is on A21 and goes to AA21 as a result of a grade change and then "earns" a reduction in their handicap down to AA20 then no review will occur as 20m is less than 21m and they will stay on 20m but become A20

7.3.4. If the shooter's membership handicap is smaller than the benchmark handicap

- for the shooter's new grade then
- no handicap review will occur
- eg if shooter is on AA18 and goes from AA to A then no review as 18m is less than 19m

7.3.5. If none of the above four are applicable

- the shooters **handicap will reduce** to the maximum of
- the benchmark handicap for their new grade; and
- their grade downgrade handicap floor
- eg if a shooter was regraded from A20 to AA21 and then was regraded back to A grade they would return to A20 and not to A19
- eg if a shooter was regraded from A19 to AA21 and then was regraded back to A grade they would return to A19 as they had no earned meters from when they were in A grade

7.4. Trap Grade Benchmark Meterage's

- AA 21m
- A 19m
- B 17m
- C 15m

MCMS Handicapping Algorithm – Configured Parameters

These parameters have been agreed with the Rules Supervisors and ACTA Executive.

Should a change be required to the parameters a manual “locking in” of a shooter’s current handicap would be required prior to the change. The handicap calculation would then start fresh with the new parameters and only scores after the “lock-in” date would be considered.

Skills:	Double Barrel (DB)
Competition Events:	Included: Handicap (ACTA Meterage)
	Excluded: Common Mark, Graded Meterage and Handicap Free Targets Continental, Point Score and Single Barrel

Minimum:	20 Target possible for Score to be Included
Floor:	60% for Score to be Included

Benchmark Meterage's	Trap Grade	AA	A	B	C
	Meterage	21m	19m	17m	15m

Movement Parameters	0.5m Downgrade	Stable	1m Upgrade	
	Agg % of best 100T of last 150T	Agg % of best 100T of last 150T	50T straight within a Single Event	Agg % of best 100T of last 150T
	Less 90.0%	90.0% < > 97.0%	100%	97.0% or Greater