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A R T I S T I C S W I M M I N G

INTRODUCTORY GUIDE FOR THE USE OF DIFFICULTY CHART

FINA Artistic Swimming Innovation Group

(L. Schott, O. Brushnikina, A. Montero, S. Saidova, I. Butuzova, A. Petrenko, K. Heald, J. Buckingham, MJ. Bilbao)

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Dear AS Family,

Over the last three years the Innovation Group has been working in the specific area of difficulty in routines looking for opportunities to improve or enhance the mutual comprehension of the issue among coaches, athletes, judges, media and audience.

Athletes and coaches have boosted the sport to an unbelievable level of difficulty with their athleticism and hard work, and continue to do so each season. As a result of the sport's growth and development routines are more and more amazing and awe inspiring but with an underlying complexity very hard to analyze and judge at a first sight.

Fortunately, we have solid foundations built by the enormous contributions of great coaches and judges who developed our Manual and DD Reports.

This document is the result of the Innovation Group's internal work done up to now, with the precious help of the group of FINA Lecturers and TASC Members that tested our intermediate steps. Their comments and questions helped us to progress.

We present to you the work done in routine hybrids. This document is meant to explain the use of the "difficulty chart" that needs to be tested by you.

The first goal is to check if you find in our descriptions all possible combinations of different components of a hybrid (movements), as well as the added values (bonuses) specific for routines -number of swimmers, apnea time, patterns, placement... etc.

For your information, the values for movements that you will see in the chart have been obtained by normalising current values inside our transitions categories. Bonus values have been assigned after internal testing by the Innovation Group according to the appreciated subjective difficulty and trying to be proportionate to the difficulty values of movements. Extensive testing will reveal the validity and adjustments will be applied if required.

We highly appreciate your participation in this first testing.



HYBRID DIFFICULTY COMPONENTS are considered under two areas:

1. **MOVEMENTS** that compose all transitions in a hybrid, grouped in “families” (see document “Artistic Swimming Difficulty System: The Description”), namely:
 1. ROTATIONS
 2. THRUSTS
 3. FLEXIBILITY
 4. ANGLES and UNBALANCED MOVEMENTS
 5. HEIGHT CHANGING and ISOLATED MOVEMENTS
 6. CONNECTED MOVEMENTS

2. Added difficulty factors specific of routines (**BONUS**)
 1. NUMBER OF MOVEMENTS PERFORMED
 2. TIME UNDERWATER (apnea)
 3. TRAVELLING
 4. SPEED
 5. PLACEMENT
 6. SYNCHRONISATION
(number of swimmers performing same movement at same time)
 7. PATTERN CHANGES
(Teams, Free Combination and Highlight Routine)

GENERAL PRINCIPLES

When Vertical Position is indicated it includes variants of 2 legs close to vertical (legs can be up to 45° off from vertical)

When a **movement** (other than rotation and thrust), is repeated during a hybrid it will be counted only two times taking always the highest values. Example: If there are three flexibility movements performed; 2 of Level 1 and 1 of Level 3, the value obtained will be 1 x Level 1 + 1 x Level 3.

Each rotation and thrust movement adds its value despite the number of repetitions.

Bonus repetitions during a hybrid: travelling is counted once per hybrid; pattern changes are counted each and a single extra bonus is given if 2 or more complex pattern changes are done (see page 10).

In teams: when the movement or bonused action is not performed by all team members its value will be factored by *0.5 (in case of half of swimmers included), or by *0.3 (less than half of swimmers included). This principle applies in pair actions where just one swimmer is performing an action while the other performs surface accompaniment.



FAMILIES OF MOVEMENTS

1. ROTATIONS “R”

This group includes all types of rotations: twists, spins, twirls (as defined in AS Rulebook BM) and swirls (rotation performed in a pike position or other positions where body is not aligned with its vertical axis).

For descending spins, the definition of degrees is by submersion of feet.

For ascending spins, the definition of degrees starts when feet break the water's surface.

Various modifications of leg positions during rotations are allowed.

Rotations with one leg (Bent Knee Vertical Position, Fishtail, Crane, Knight) and other position options.

Rotations with two legs (Vertical Position “VP”, Fishtail close to vertical, Arch VP) And other positions where 2 legs are clearly visible close to the vertical line.

a) Level 1 includes rotations with **one or two legs:**

Swirl 180°-1080°

Spin descending 180°

Twists 180°

b) Level 2 includes rotations with **one or two legs:**

Swirl 1440°

Spins ascending 180°-360°

Spins descending 360°-720°

Twist 360 with **1 leg only**

c) Level 3 includes rotations with **one or two legs:**

Spins ascending 720°-1080°,

Spins descending 1080°-1440°.

Twist 180°-360° with **2 legs only**

d) Level 4 includes rotations with **one or two legs:**

Twist 720° with 1 leg,

Spin 1440° with 1 leg;

Twist opening 360° VP to Split

Twirl 180°-360° with 2 legs,

Combined spins 360°-720° with 1 leg



e) Level 5 includes the rotations with **two legs only**:

- Combined spins 360°
- Spin more than 1440°
- Twist 720°
- Twist Closing 360° from Split to VP

f) Level 6 includes the rotations with **two legs only**:

- Combined spins 720°
- Twists 720°-1080°

g) Level 7 includes the rotations with **two legs only**:

- Combined spins 1080°
- Twist 1440°
- Rotation in Arch VP 360°-720°

h) Level 8 includes the rotations with **two legs only**:

- Combined spins 1440°
- Rotation in Arch VP 720° and over

2. THRUSTS “T”

This group includes variations of thrusts:

a) Level 1

Thrust with crashing on the surface (means “not completed” thrust: From a Submerged Back Pike Position, a vertical upward movement of the legs and hips is rapidly executed as the body unrolls to assume a Vertical Position) and continues by “falling” on the surface)

b) Level 2

Thrust with one leg: Thrust with the Bent Knee Vertical Position or Thrust in a Fishtail position

c) Level 3

Thrust with two legs and vertical descent;
Thrust followed leg movements **while descending**.



d) Level 4

Thrust with flexibility at maximum height, like Airborne Split Position or Vertical to Knight, with any ending except crashing on the surface.

e) Level 5

Thrust with or without flexibility followed by rotation 360° or twirl (Example: Thrust with Airborne Split Position or splits that show body alignment under hips, as described in BP. Body alignment means: Lower back arched, with hips, shoulders and head on a vertical line).

f) Level 6

Thrust with or without flexibility action + rotation of spin 720° and over.
(Thrust continued by Spin or Continuous Spin)

g) Level 7

Thrust continued by catching a sustained vertical position with or without movements (sustained vertical position: see 5.e).

3. FLEXIBILITY "F"

Difficulty increases with the inclusion of hybrid figures that require an extreme range of flexibility (bring a joint to its maximum range of motion), such as Walkouts, Nova lift, Aurora open, Knight and Split.

a) Level 1 - Pike to Split

b) Level 2 - Split closing to VP; Ariana and variants (splits at the surface)

c) Level 3 - Split to split through VP;

d) Level 4 - Knights: combinations of Knight positions; sustained Knight position.

e) Level 5 - Surface Arch to VP.

All positions should be shown with maximum strength in legs and a body position that demonstrates the flexibility of the athletes.

The duration of execution should be sufficient to be clearly identify the difficulty by the judges and controllers.

4. ANGLES "A"

a) Level 1 - The hybrid shows angles but there is not more than 1 complex angle (see Angles Level 3 for Complex Angles definition).

b) Level 3 - The hybrid shows 2 or more complex angles.



Definition of complex angles:

- Large joint movements involving different axes and planes. (Not considered in Solo routine).
- Positions where several joints are angled (toes, ankle, knee, hip...)
- Those figures that have micro movements of one of the joints (example knee).
- Those that involve a considerable displacement of the center of gravity or in continuous displacement.
- Angles which involve unbalanced movements.

5. HEIGHT CHANGING/ISOLATED “H”

This group includes:

a) Level 1

Vertical descent in Vertical Position or Vertical Bent Knee Position (not as part of a thrust or a spin)

b) Level 2

Vertical ascent in Vertical Position or Vertical Bent Knee Position (not as part of an ascending spin).

Descending (Level 1) and ascending (Level 2) movements in which one leg stays in a fixed position while the other performs movements (isolated movements) with body in vertical alignment with fixed leg.

c) Level 3

Isolated movements in stable VP (less than 3”), Fishtail Position, and piked body position (legs over the water surface)

d) Level 4

Sustained height shown for at least 3 seconds in Vertical Position

e) Level 5

Sustained height shown for at least 3 seconds in Vertical Position with travelling 1 meter minimum in any direction

6. CONNECTIONS “C”

When swimmers join or link together they create a “connection” action.

The swimmers must be touching in some manner during the performance of the connection action.

The bonus is awarded once per connection and it does not matter how many times the positions are changed.

a) Level 1 - Plane connection (surface connection)

When swimmers are connected by any part of the body in the Back Layout Position, Front Layout Position, Side Layout Position or Pike position at the surface of the water.



- b) **Level 2** - One leg face-to-face connection
When swimmers are connected with one leg facing each other in any vertical position.
- c) **Level 3** - One-leg back connection
When swimmers are connected with one leg back or to side of each other in any vertical position.
- d) **Level 4** - Two-leg connection
When swimmers are connected with two legs facing, back or side to each other in any vertical position.
- e) **Level 5** - Rotation vertical connection
When swimmers are connected with one or two legs facing, back or side to each other in any vertical position while performing a rotation.

BONUS

1. NUMBER OF MOVEMENTS

- **Definition of a Hybrid Movement** = a definitive change in the position or direction of the lower limbs as mandated by the choreography of the routine.
- Spins: each $\frac{1}{2}$ turn (180°) shall count as 1 movement
- Twists: each $\frac{1}{2}$ turn (180°) shall count as 1 movement - Twirls: each $\frac{1}{2}$ turn (180°) shall count as 1 movement
- A “swirl” action counts as one movement from it’s beginning to it’s clear stopping point or next clear action as momentum/force must be considered.
- Fast kick type actions (for example fast “tendu” like action similar to ballet: movement in ballet where the working leg is extended along the floor until only the tip of the toe remains touching the floor) shall count as 1 movement (i.e. there is a clear exertion of energy/muscle tension and then a recovery)
- In regards to entries and exits:
 - Front Pike Pulldown - the action of the body bending into the pike position is 1 movement, with counting continuing from there
 - Entry from a Ballet Leg - A Ballet Leg kick counts in the hybrid if used as an entry into the hybrid (kick up and then a Catalina like rotation, kick up and then into inverted tuck, etc.)
 - No movements shall be counted underwater – for example, a tuck from ankles at the end of a spin would count as one movement, however if the athlete(s) tuck when completely submerged no movement shall be counted
- In regards to “Back-to-Back” hybrids:



- Shall be ONE hybrid if no breath is taken in between. For example, a hybrid is executed and then a front walkout ending appears to be taking place BUT the athlete(s) DO NOT break their face and breathe and instead tuck and continue with more movements. This is ONE hybrid, totalling all movements.
- In comparison IF the athletes face(s) break the surface and they breathe in Back Layout the hybrid has ended, and if they continue into another hybrid it will be considered a separate hybrid with movements counted accordingly.
- No. of movements in a hybrid will be given credit in 4 categories:
 - **(1)** 6 movements or less
 - **(2)** 7-19 movements
 - **(3)** 20-29 movements
 - **(4)** 30+ movements

2. UNDERWATER TIME

- STAND-ALONE HYBRID:
Hybrid underwater time shall be timed from “breath to breath” – from taking entry breath to go under (pull down, arch back, body boost, etc.), to first surfacing breath after completing the hybrid (roll up from walkout, body boost, eggbeater surfacing, etc.)
- ACRO/DIVE-IN INTO HYBRID:
In the case that a hybrid takes place in combination with an acrobatic movement/highlight OR from directly after the dive-in, the underwater time shall be counted from the first movement of the hybrid to the surfacing breath.
- HYBRID FOLLOWED BY ACRO:
In the case that the hybrid takes place in combination with an acrobatic movement/highlight occurring directly after a hybrid, the underwater time shall be counted from taking the entry breath, to the last movement of the hybrid.
- Time underwater will be given credit in 3 categories:
 - Short** 6 sec or less
 - Medium** 7-15 sec
 - Long** 16 - 20 seconds and over

3. TRAVELLING



Movement of all swimmers at any distance during the hybrid.

If the Hybrid started at one point in the pool and finished at another point in the pool, having covered any distance, then a traveling bonus will be awarded.

Any pattern changes taking place in one point in the pool are not considered as traveling.

The bonus is awarded once per hybrid.

4. SPEED

To be established from the relation (ratio): number of movements/time underwater. This bonus will be calculated automatically. Not to be tested.

5. PLACEMENT

Moment in routine time when the hybrid is performed. Bonus applied when a hybrid is performed during the last 20 seconds of the routine

6. SYNCHRONISATION

Partially Synchronised Hybrid - This bonus is awarded for synchronized parts in a hybrid that consist of 3 or more movements. The bonus can be added not more than 2 times per hybrid.

Full Synchronised Hybrid - This bonus is awarded for a fully synchronized hybrid, as well as if the hybrid has a maximum of 3 asynchronous movements.

NOTE: synchronisation of part or whole hybrid means that all athletes perform the same movements at the same time.

7. PATTERN CHANGE

Changes of formations made by the spatial relationship between members of a team.

a) Simple pattern changes

Those where athletes see each other and can control the accuracy of the pattern.

b) Complex pattern changes

Changes from large patterns to compact patterns and from compact patterns to larger patterns.

Blind pattern changes where athletes cannot see each other while performing back or side pattern changes.

NOTE: Traveling of all athletes in the same direction while maintaining the pattern does not count as a pattern change. (see point 3. Traveling)



HOW DO ALL OF THESE HYBRID COMPONENTS GO INTO A DECLARED DIFFICULTY CARD?

Now we provide you with the difficulty chart for hybrids and an example of what a filled difficulty card and a filled calculator form look like.

IMPORTANT REMARK: Each hybrid has a **BASE MARK** that is calculated to reflect the difficulty level of every movement that compose a particular hybrid. To calculate the Base Mark of a hybrid a formula is used so the level of the different movements included in the hybrid are balanced.

The Base Mark is automatically calculated when you use the calculator.

Any difference between declared and observed difficulty in competition will result in reducing the hybrid value to its calculated Base Mark.



DIFFICULTY TABLE:

HYBRIDS

HYBRID BONUSES

BONUSES	NUMBER OF MOVEMENTS: 6 or less - <u>0.05</u> 7-19 - <u>0.10</u> 20-29 - <u>0.20</u> 30+ - <u>0.30</u>	TIME UNDERWATER: Short (6" or less) - <u>0</u> Medium (7" - 15") - <u>0.10</u> Long (16"-20" and over) - <u>0.20</u>	TRAVELLING: More than 0.5m - <u>0.15</u>	SPEED: Presto (30 bpm) - <u>0.15</u> Prestissimo (40 bpm) - <u>0.25</u>	PLACEMENT: Hybrid in last 20" - <u>0.20</u>	SYNCHRONISATION: Partial Synchronised - <u>0.1</u> Full Hybrid Synchronised - <u>0.5</u>	PATTERN CHANGE Simple change patterns - <u>0.1</u> Complex pattern changes - <u>0.3</u>
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LEVEL	ROTATIONS (R)	THRUSTS (T)	FLEXIBILITY (F)	ANGLES (A)	HEIGHT CHANGING (H)	CONNECTIONS (C)
LEVEL 1	ONE OR TWO LEGS: Swirl 180-1080 Spin descending 180 Twists 180	Thrust with crashing	Pike to split	The hybrid shows angles but there are not more than 1 complex angle	Vertical descent in VP or VBP	Plane connection (surface connection)
	<u>0.15 - 0.35</u>	<u>0.30</u>	<u>0.10</u>	<u>0.05</u>	<u>0.15</u>	<u>0.15</u>
LEVEL 2	ONE OR TWO LEGS: Swirl 1440 Spins ascending 180-360, Spins descending 360-720, Twist 360 with 1 leg only	Thrust with one leg	Split closing to VP; Ariana and variants (splits at the surface)		Vertical ascent in VP or VBP Descending (Level 1) and ascending (Level 2) during isolated movements	One leg face-to-face connection
	<u>0.40 - 0.45</u>	<u>0.35</u>	<u>0.15</u>		<u>0.20</u>	<u>0.20</u>
LEVEL 3	ONE OR TWO LEGS: Spins ascending 720-1080, Spins descending 1080-1440, Twist 360 with 2 legs	Thrust with two legs and vertical descent	Split to split through VP	The hybrid shows 2 or more complex angles.	Isolated movements in stable VP (less than 3"), Fishtail Position, and piked body position	One-leg back connection
	<u>0.50 - 0.55</u>	<u>0.40</u>	<u>0.20</u>	<u>0.15</u>	<u>0.25</u>	<u>0.25</u>
LEVEL 4	ONE OR TWO LEGS: Twist 720 with 1 leg, Spin 1440 with 1 leg, Twist opening 360 VP to split Twirl 180-360 with 2 legs, Combined spins 360"- 720 with 1 leg	Thrust with flexibility	Knights: combinations of Knight positions; sustained Knight position.		Sustained height shown at least 3" in Vertical Position	Two-legs connection
	<u>0.60</u>	<u>0.45</u>	<u>0.25</u>		<u>0.30</u>	<u>0.30</u>
LEVEL 5	TWO LEGS ONLY: Combined spins 360" Spin 1440 Twist 720 Twist Closing 360 from split to VP	Thrust with or without flexibility followed by rotation 360° or twirl	Surface Arch to VP		Sustained height shown at least 3" in Vertical Position with travelling 1 meter minimum in any direction	Rotation vertical connection
	<u>0.65</u>	<u>0.50</u>	<u>0.30</u>		<u>0.40</u>	<u>0.40</u>
LEVEL 6	TWO LEGS ONLY: Combined spins 720" Twists 720-1080	Thrust with or without flex action+ rotation spins 720 and over				
	<u>0.70</u>	<u>0.55</u>				
LEVEL 7	TWO LEGS ONLY: Combined spins 1080" Twist 1440 Rotation in Arch VP 360-720	Thrust continued by catching a sustained vertical position				
	<u>0.75</u>	<u>0.60</u>				
LEVEL 8	TWO LEGS ONLY: Combined spins 1440 Rotation in Arch VP 720 and over					
	<u>0.80</u>					



EXAMPLE OF FILLING OUT THE DIFFICULTY CALCULATOR:

Elements				Bonuses			Result:
Nº	Family	Level	Score	Type	Bonus	Score	
							3,77
1	Rotations (R)	4	0,60	Number of movements	20-29	0,2	
2	Thrusts (T)	1	0,30	Time Underwater	Long (16" and more)	0,2	
3	Flexibility (F)	4	0,25	Travelling	More than 0.5 m	0,15	
4	Angles (A)	3	0,15	Speed	Prestissimo	0,25	
5	Height changing and Isolated (H)	4	0,30	Placement	Hybrid in last 20"	0,2	
6	Connections (C)	2	0,20	Synchronization	Partial synchronized	0,1	

ABBREVIATIONS:

Legend

Families (groups)		Families (groups) + Level
Rotations	R	R1
Thrusts	T	T2
Flexibility	F	F5
Angles	A	A1
Height changing and Isolated	H	H3
Connections	C	C4

Bonuses		Bonuses + Level
Change patterns	CP	CP
Number of movements	NM	NM4
Time underwater	TU	TU2
Travelling	TR	TR
Speed	SP	SP1
Placement	PL	PL
Synchronisation	SY	SY1



EXAMPLE OF DIFFCULTY SHEET FOR COMPLETION BY COACH:

Coach card

Participant	John Doe										
Country	USA										
Event	Solo										
Start number	1										
	Families										difficulty
HYBRID- 1	A1	A3	F5	T2	T1	A3	H2	C4			1.15
Check											
BONUSES	NM4	TU2	TR	SP1	PL						1.35
Check											
	Total										
HYBRID- 2	A1	A3	C4	T2	T1	F5	A3				1.15
Check											
BONUSES		NM4	TU2	TR	SP1	PL					1.35
Check											
	Total										

ARTISTIC SWIMMING DIFFICULTY FORMULA:

1. ROUTINE DIFFICULTY

$$R = \sum_{i=1}^n D(i)$$

R – Routine difficulty

D – Single hybrid difficulty function

i – Hybrid

n – Number of Hybrids in Routine

2. HYBRID DIFFICULTY

$$D = \left(\sum_{j=0}^m S_j + \sum_{k=0}^o B_k \right) * \left(1 + \frac{\sum_{j=0}^m L_j}{10m} \right)$$

D – Single hybrid difficulty

S – Score for movement

B – Score for bonus

L – Movement level

j – Movement

k – Bonus

m – Number of movements in Hybrid

o – Number of bonuses in Hybrid