COAC:

AN EXPEDITED PATH TO COMPETITIVE PLAY

written by [1]

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with

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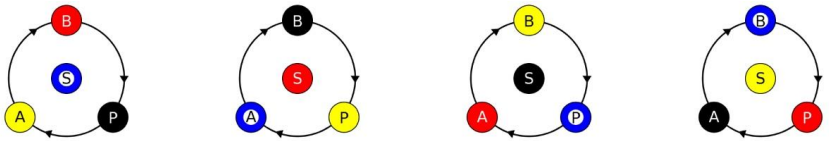
[1] Word Version COAC Compete (25-04-12)

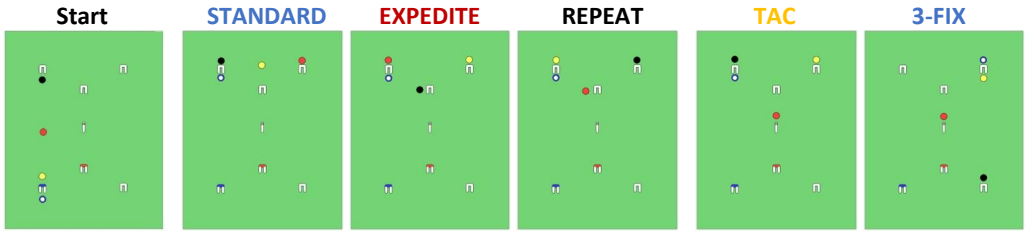
COAC: THE ONE PAGE SUMMARY

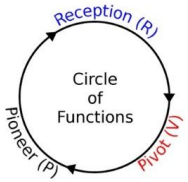


(S=Striker, A=AFTER, B=BEFORE, P=Partner, RB=Reference Ball)

AC Rules plus these additions:

1. Striker must use the balls in CO as set by the 1st roquet to start a turn, and then reset by the 1st roquet after making each hoop.
2. Striker may not score h(10) for himself unless: (i) Striker's team has peeled a ball (Partner or Oppo) to score h(10), or (ii) Oppos have peeled one of the Striker-Team balls to score h(10). Striker making h(10) on his own always grants a lift-to-contact.





Major Procedures

Name	R	Steps	V	Steps	P	Steps	L&H
STANDARD	V	1	P	1	R	1	No
EXPEDITE	P	2	R	2	V	2	Yes
REPEAT	R	0	V	0	P	0	Yes
TAC	P	2	V	0	R	1	No
3-FIX	P	2	V	0	R	1	No
3-L&H	R	0	V	0	P	0	Yes
2-BALL	R	0	V	0	P	0	No

The Arithmetic of Color Order – Using the Circle of Functions

Striker is at h(i) where the RB has Function R, V, or P – this is what you "HAVE". After k hoops Striker will be at h(i+k) where you "WANT" the RB to be – specify: R, V, or P. The Question is: will **STANDARDs** get the RB from HAVE to WANT or is an **EXPEDITE** or a **REPEAT** needed? To Answer: From HAVE, see what Function RB will "GET" to in k hoops if only **STANDARDs** are used – move mod(3:k) steps around the circle from HAVE. Is that what you WANT? If yes, then only **STANDARDs** are needed If no, then starting from GET, move one or two steps forward until WANT is reached. If one step, then an **EXPEDITE** Procedure is needed; if two steps then a **REPEAT** Procedure is needed. In all cases equivalents can be considered.

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I.. INTRODUCTION

We created COAC for players seeking a new T-AC-based challenge that is especially relevant when conditions are "trivial". We provide samples of tournament play at our YouTube Channel and have documented the game in three ways:

(i) COAC: THE ONE PAGE SUMMARY appears as page ii above. It provides the essentials required to start playing.

(ii) Colot Order Association Croquet is available for free at our Google Drive. It presents the complete rules of this game and analyzes their strategic implications for Openings, Peeling Turns, Leaves, Peg-out end games, 4-Turn Finishes, etc. It is a deep dive into COAC.

(iii) This book is a summary of the original: It is for players who want an expedited path to competitive play – to TP's and Leaves. It is culled from the original book, *literally* leaving chapter and figure numbers intact to afford immediate reference between the documents.

T-AC vs COAC: In T-AC Striker can use the balls in any order. But in COAC Striker must roquet them in Color-Order ("CO"). From the start of a turn until an initial hoop is made, and then again from hoop to hoop as his break progresses, Striker will roquet an initial ball and it will determine which ball can be roqueted 2nd and then 3rd, if so desired. Striker can enter his "circle" – shown at the top of the COAC:THE ONE PAGE SUMMARY – at any point by roqueting a specific ball. But then Striker *must* progress in a clockwise fashion around the circle if he chooses to use more than one ball in the process of making a hoop or setting a leave. Making a new hoop allows Striker to reset the CO. The major impact of CO in COAC is that each ball has one associated Escape-Ball, the ball next in CO after Peelee, rather than the two that are available in T-AC. This is the fundamental difference between T-AC and COAC and greatly increases the challenge of Peeling.

Other major differences arise with respect to lifts and the required peel at h(10). Making h(7) In both T-AC and COAC grants Oppos a lift-to-baulk. In T-AC making h(10) grants an additional lift-to-baulk – unless h(7) and hI10) are made by the team's initial ball in the same turn in which case Oppos get a lift-to-contact. In COAC Striker *may not* score h(10) for himself unless Striker's team has peeled a ball (Partner or Oppo) to score h(10), or Oppos have peeled one of the Striker's balls to score h(10). And, *Striker making h(10) always grants Oppos a lift-to-contact*. "Only" one peel is required in COAC– at h(10) – but getting it done in the appropriate manner at the appropriate time can consume significant mental energy!

II.. PROCEDURES

"Procedures" are ways Striker can play the balls to make hoops, set leaves, and perform peels.

Notation and Conventions: We use numbers (1-12) to identify hoops. We let "h" stands for hoop and use "i" as the number of Striker's Current-Hoop – h(i). (i+1) identifies Striker's Next-Hoop – h(i+1).

Functions: Explicitly or implicitly, Striker assigns and then reassigns "Functions" to each of the three non-Striker balls as he plays hoops in a break. Each ball is always assigned one of three Functions: R(i) – Reception-Ball, V(i) – Pivot-Ball, and P(i+1) – Pioneer-Ball. *However, other than natural efficiency, nothing in COAC forces Striker to use all four balls to make a hoop or to keep the balls in identifiable functional positions. All that is required is that the balls be roqueted in CO.*

Striker Ball: In general, we use u as the Striker for initial breaks, and his Partner k as the Striker for peeling turns.

Reception-Ball: R(i) is the 1st ball roqueted after a hoop. It is typically found on the non-playing side of the Current-Hoop.

Pivot-Ball: V(i) is the 2nd ball used. It can be anywhere on the lawn but traditionally it is positioned to limit the need for big roll-shots during break play, to facilitate setting a leave, to set-up for peels, or to continue a break after a Back-Peel.

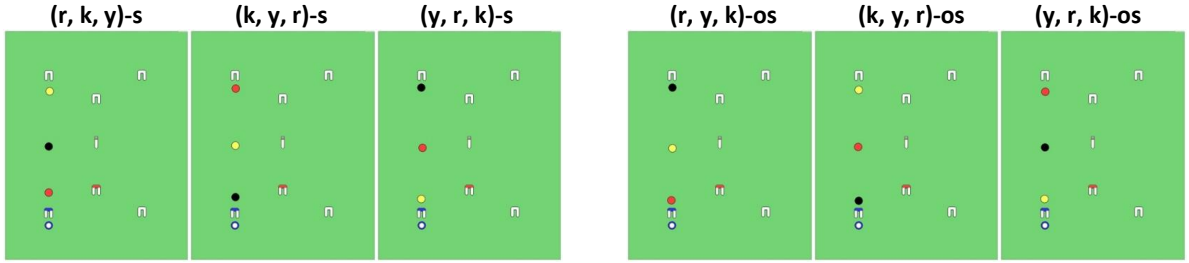
Pioneer-Ball: P(i+1) is the 3rd ball used in a 4-ball break. It has three roles in COAC. (i) As in T-AC, it is most often placed on the playing side close to Striker's next hoop, h(i+1). (ii) In both T-AC and COAC, the Pioneer-Ball can be moved to an Escape-Ball position to facilitate travel by Striker to the Pioneer-Hoop after a peel attempt. Here it is identified as E(i+1,j) – where "E" stands for Escape, (i+1) is the Pioneer-Hoop, and j is the Peeling-Hoop. (iii) Finally, in COAC, there is an additional possibility: The Pioneer-Ball can intentionally be in a misplaced position, typically as the result of a peel. Here it is identified as M(i+1,j) – where M" stands for Misplaced-Pioneer, (i+1) is the Pioneer-Hoop and j iis the old Peeling-Hoop.

Identifying the Peelee: Depending upon the circumstances, the ball to be peeled after Striker makes h(i) and before Striker makes h(i+1) can be the *1st ball* – the Reception-Ball, R(i), as in a Back-Peel – in this case we say the peel is attempted "After" h(i) or A-h(i); the *2nd ball* – Pivot-Ball, V(i), as in a Transit-Peel, the peel is attempted On-the-Way-to h(i+1) or W-h(i+1), or the *3rd ball* – the Pioneer-Ball, P(i+1), as in a Straight-Peel – in this case the peel is attempted just before Striker makes h(i+1), "Straight", S-h(i+1). We call these R(i,j), V(i,j), P(i+1,j) where i is Striker's Current-Hoop, and j is the Peeling-Hoop.

Color Order (CO) and Functional Order (FO)

Figures II.1 to II.6 show the six different ways Striker (u) can organize the three non-Striker balls (r, k, and y) by color during break play. In each case, u is in position to make h(1). In both T-AC and COAC, Striker will typically make h(1) and then use (roquet) the ball closest to him. The first ball used is, by definition, the Reception-Ball, R(1) and in COAC it establishes the Color Order (CO). We list the resulting CO above each figure in parentheses presuming the obvious ball will be roqueted after the hoop is made. [Striker could roquet a more distant ball, in which case it would set the CO]. This new CO applies between h(1) and h(2), that is, until the next hoop, h(2) is made. Then the first ball roqueted after h(2) determines the CO between h(2) and h(3), etc.

Six Ways to Organize the three non-Striker balls



In T-AC, Striker can ignore the color of the balls and use them in their natural "Functional Order" (FO). But in COAC, this way of running a break may or may not be possible. In Figures II.1, II.2, and II.3, the order of play, as dictated by CO, is "in sync" – [indicated by an "-s" after the "()"] – with the way u would normally like to play the balls – their FO. But in Figures II.4, II.5, and II.6, the order of play is "out of sync" – "os" – with the FO that Striker would typically pursue in the absence of the CO Rule.

How Procedures Arise and the Chart of Procedures

As Striker runs a break, Implicitly or explicitly, he is reassigning "Functions" to each of the three non-Striker balls. He does this with "Procedures" that specify how the balls are to be played (how they are to be moved around the lawn) between making h(i) and h(i+1). For the purposes of this book, Procedures extend over two hoops [2]. That is, collectively the balls go from having Functions [R(i), V(i), and P(i+1)] at h(i) to having Functions [R(i+1), V(i+1), and P(i+2)] at h(i+1). This is true no matter how many balls Striker uses (4, 3, 2, or just 1) to make his next hoop. Alternative ways this can be accomplished are shown in the Chart of Procedures presented below.

Using Procedures advantageously requires understanding the "Arithmetic of CO" and key to this is the ability to "quantify" – measure – the movement of balls as they change Functions. We do this using the Circle of Functions shown at the top right of the COAC: A ONE PAGE SUMMARY: A ball starts with one Function at h(i) and "rotates" to another at h(i+1). Therefore, moving clockwise around the Circle of Functions from a ball's starting Function to its ending Function provides a way of counting the number of Functional Steps ("FS") taken by each ball. Balls can move the same or a different number of FS as part of a Procedure. In all cases: R→V, V→P, and P→R move the balls 1 FS; R→P, V→R, and P→V move them 2 FS; and R→R, V→V, and P→P move them 3 FS.

Movement around the Circle of Functions is independent of the hoop a ball is coming from or going to. Thus moving 4, 7, or 10 steps around the circle gives the same answer as moving 1 step; 5, 8, or 11 steps gives the same answer as moving 2 steps and 3, 6, 9, or 12 steps gives the same answer as moving 0 steps. Therefore, the Arithmetic of CO can be simplified using Mod (3, j) where "Mod" is the Modulus function, base 3, and j is the number of steps taken around the Functional Circle.

*CO is a rule, while FO is a convenience***.** Striker can choose any ball to use first after making a hoop if he can roquet it. That ball sets the CO and determines the 1st element of FO – the Reception-Ball. The chosen CO must then be followed until the next hoop is made. However, FO is flexible because: (i) Striker can vary the number of balls used to make his next hoop, skipping balls in the process if he wants to; and (ii) Striker can double load a hoop, positioning the balls such that either ball can be used as Reception after he makes the hoop. Striker may think (and intend!) that his play has assigned Functions to the balls at the next hoop in a particular way, only to find when he goes to continue his break at the next hoop that using them in different Functions is desirable. This is perfectly ok! In fact, it is useful to view all functional assignments as tentative (ambiguous) to have flexibility when a situation changes – when things go wrong, or when opportunities arise, especially with respect to peeling. This way of thinking is what makes for resourceful – good! – play in COAC. *Remember, Functions are only revealed by how balls are ultimately used.*

[2] The **3-4-BALL** Procedure is the only outlier to this 2-hoop rule. It is described in the original book.

Using 4 Balls: Suppose Striker is about to make h(i) and looks to progress to h(i+1) using all three non-Striker balls. The 1st ball Striker roquets after making the hoop is, by definition, R(i) and sets the CO for the other balls. R(i) can be sent to a position on the lawn associated with any of the three Functions of h(i+1): [R(i+1), V(i+1), or P(i+2)]. That is, the "old R" – R(i) – can become "→": the "new R" – R(i+1), the "new V" – V(i+1), or the "new P" – P(i+2). Striker makes this determination as he goes to the 2nd ball. If CO and FO were in sync at h(i), then this 2nd ball will be V(i). It can be assigned either of the two remaining unallocated Functions as Striker goes to the 3rd ball. By default, the 3rd ball assumes the last available Function for h(i+1) as Striker goes to position at h(i+1). There are six ways the three non-Striker balls can be reorganized when CO and FO start in sync. Thus, there are six 4-ball Procedures. The first four are used in multiple ways. They are grouped together in the 1st panel of the Chart of Procedures. The final two are grouped together in the 2nd panel of the Chart. We have found "limited" uses for one and, "mysteriously", no uses for the other.

Using 3 Balls: Next, suppose Striker is about to make h(i) and looks to progress to h(i+1) using only two non-striker balls. Again, the 1st ball Striker roquets after making h(i) is R(i) and sets the CO of the 2nd ball. If CO and FO are in sync at h(i), then the 2nd ball will have been positioned as if it is the V(i) in a 4-Ball break. In choosing to use only three balls to make his hoop, Striker will ignore the 3rd non-Striker ball which was positioned as P(i+1). If, by design or default, CO and FO are out of sync at h(i), then the 2nd ball Striker goes to will be in CO but functionally will be P(i+1) and not V(i). As with 4 balls, in the 3-Ball case, the first ball Striker uses is R(i) and can be assigned (i.e., sent to a location on the lawn associated with) any of the three functions related to the next hoop [R(i+1), V(i+1), and P(i+2)] as Striker goes to the 2nd ball. This ball, whether it was originally thought of, as V(i) or P(i+1), can take on either of the two unallocated Functions as Striker goes to position at h(i+1). Finally, the 3rd un-played ball will be assigned the Function not already assumed by the 1st or 2nd balls. There are three Procedures involving just three balls. They are listed in the 3rd panel of the Chart.

Using 2 Balls: Suppose Striker is about to make h(i) and looks to make h(i+1) using only one of the non-Striker balls. Again, the 1st ball Striker uses after making h(i) is R(i). But now, Striker needs to go and make h(i+1) and so Striker sends R(i) to R(i+1). as Striker goes to position at h(i+1). The other two balls do not move and maintain their Functions, now associated with h(i+1). There is only one 2-ball Procedure. It is listed in the 4th panel.

Finally, nothing prevents Striker from making a hoop without an intervening roquet.

The Chart of Procedures

The data in this chart tells how the three Functions R(i), V(i) and P(i+1) are reassigned by each Procedure as Striker plays from h(i) to h(i+1). It also tells if a Load-and-Hold (L&H) is involved, when the Procedure can be used (i.e., starting with CO and FO in sync, or not), and if CO and FO are still in sync at the end of the Procedure. An "*" signifies that a ball is skipped during the Procedure, but still has its Function changed. Finally, the three columns labelled "Steps" tell how many Functional Steps, FS, a Procedure takes each individual ball around the Functional Circle (in a clockwise direction) from its starting position.

Name	R(i)	Steps	V(i)	Steps	P(i+1)	Steps	L&H	Sync @ Start	Sync @ Finish
STANDARD	V(i+1)	1	P(i+2)	1	R(i+1)	1	No	Yes	Yes
TAC	P(i+2)	2	V(i+1)	0	R(i+1)	1	No	Yes	No
EXPEDITE	P(i+2)	2	R(i+1)	2	V(i+1)	2	Yes	Yes	Yes
REPEAT	R(i+1)	0	V(i+1)	0	P(i+2)	0	Yes	Yes	Yes
LIMITED	V(i+1)	1	R(i+1)	2	P(i+2)	0	Yes	Yes	No
MYSTERY	R(i+1)	0	P(i+2)	1	V(i+1)	2	Yes	Yes	No
3-FIX	P(i+2)	2	V(i+1)*	0	R(i+1)	1	No	No	Yes
3-BALL	P(i+2)	2	R(i+1)	2	V(i+1)*	2	No	Yes	Yes
3-L&H	R(i+1)	0	V(i+1)*	0	P(i+2)	0	Yes	Yes	Yes
2-BALL	R(i+1)	0	V(i+1)*	0	P(i+2)*	0	No	Yes	Yes

Detailed descriptions of these Procedures are presented in the remainder of this section. We start with those that do not require L&H's, and then turn to those that do.

Procedures Without Load & Holds (L&Hs)

STANDARD: *[R(i)→V(i+1)], [V(i)→P(i+2)], [P(i+1)→R(i+1)]*

Suppose Striker starts a turn with CO and FO in sync as shown above in Figures II.1, II.2, and II.3 for h(1). Then the simplest way to run a 4-ball break in COAC while staying in sync, is to engage in Pivot-Swaps at each hoop. This is the STANDARD Procedure, it is fundamental to COAC.

Arithmetic: CO and FO start in sync. STANDARD moves each ball one FS clockwise around the Functional Circle: R→V, V→P, and P→R. CO and FO remain in sync.

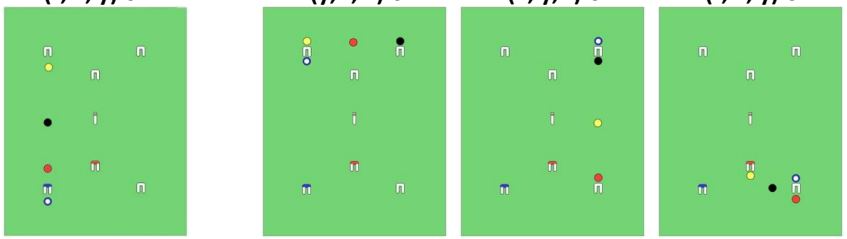


Figure II.1: u is Striker and is in position at h(1). r is R(1), k is V(1) and y is P(2). u makes h(1) and goes to r. u sends r from R(1) to V(2) – [CO is (r, k, y)] – as u goes to k. u sends k from V(1) to P(3) as u goes to y. u sends y from P(2) to R(2) as u goes to position at h(2), Figure II.7, STANDARD.

Figure II.7: u makes h(2) and goes to y. u sends y from R(2) to V(3) – [CO is (y, r, k)] – as u goes to r. u sends r from V(2) to P(4) as u goes to k. u sends k from P(3) to R(3) as u goes to position at h(3), Figure II.8, STANDARD.

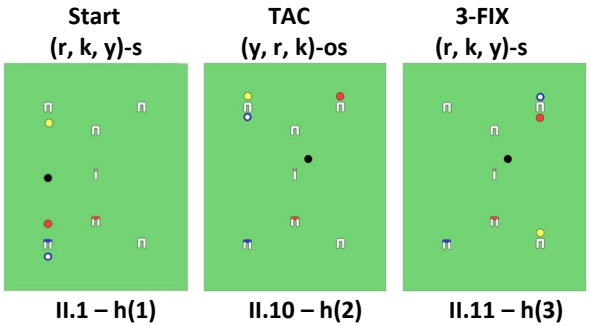
Figure II.8: u makes h(3) and goes to k. u sends k from R(3) to V(4) – [CO is (k, y, r)] – as u goes to y. u sends y from V(3) to P(5), as u goes to r. u sends r from P(4) to R(4) as u goes to position at h(4), Figure II.9, STANDARD.

Notice that the balls have the same CO and FO in Figure II.9 as they did in Figure II.1: r is R, k is V, and y is P. This example illustrates how repeated applications of the STANDARD Procedure replicate CO every three hoops, while maintaining FO at each hoop.

TAC: *[R(i)→P(i+2)], [V(i)→V(i+2)], [P(i+1)→R(i+1)]*

Arithmetic: CO and FO start in sync, TAC moves R two FS→P, V three FS→V, and P one step→R. CO and FO are out of sync.

While running a 4-ball break in T-AC, Striker often sends the Reception-Ball to be the Pioneer-Ball two hoops ahead, goes to the Pivot-Ball and moves it to a new position but maintains its Function as Pivot, and then goes to the Pioneer-Ball and moves it to Reception as Striker goes to position at that hoop. This is the TAC Procedure. It also works in COAC when CO and FO start in sync as shown again in Figure II.1. The result of one application of TAC is shown in Figure II.10, now with CO and FO out of sync.



The TAC Procedure is ingrained in all who play T-AC and can be the mainstay of running breaks. TAC has important uses in COAC, but always at a cost – CO and FO end out of sync.

Figure II.1: u makes h(1) and goes to r. u sends r from R(1) to P(3) – [CO is (r, k, y)] – as u goes to k. u sends k from V(1) to V(2) as u goes to y. u sends y from P(2) to R(2) as u goes to position at h(2), Figure II.10, TAC.

Is Brute Force Required? When CO and FO are out of sync, as they are in Figure II.10, then brute force *could* return them to sync. For example, u *could* follow the STANDARD Procedure and send y from R(2) to V(3) as u goes to r. Then u *could* send r from P(3) to P(4) as u goes to k. Finally, u *could* rush k from V(2) to P(3) and then croquet it to R(3) as u goes to position at h(3). This *could* work, but it is inelegant and COAC has better ways to proceed!

3-FIX: ***[R(i)→P(i+2)], [V(i)→V(i+2)]*, [P(i+1)→R(i+1)]***

Three of the 4-Ball Procedures (TAC – described above, along with two others – LIMITED, and MYSTERY – described below) break the sync of CO and FO. Many times, an application of one of these Procedures will be followed by an application of the 3-FIX Procedure. This is because 3-FIX is a convenient way to reestablish ("fix") the sync of CO and FO without brute force.

Arithmetic: Starting with CO and FO out of sync, using the 3-FIX Procedure moves R two FS →P. Striker does not touch/roquet V but it still moves three FS →V. Then Striker moves P one FS →R. CO and FO are returned to sync.

Figure II.10: u makes h(2) and goes to y. u sends y from R(2) to P(4) – [CO is (y, r, k)] – as u goes to r. u sends r from P(3) to R(3) as u goes to position at h(3), Figure II.11, 3-FIX.

Striker does not use/roquet the Pivot-Ball in 3-FIX, but that does not prevent it from being converted (Functionally) from V(2) to V(3). As such, at h(3), CO and FO are back in sync.

Combining TAC and 3-FIX [3] : TAC followed by 3-FIX restores the sync of CO and FO and repeats the original CO after just two hoops. In Figure II.1, r is R, k is V and y is P. These roles and colors are repeated two hoops later, Figure II.11. Thus, Striker can run breaks in COAC while maintaining a constant Pivot-Ball by alternating TAC and 3-FIX. The downside is that the position of the Pivot-Ball can only be modified with every other hoop.

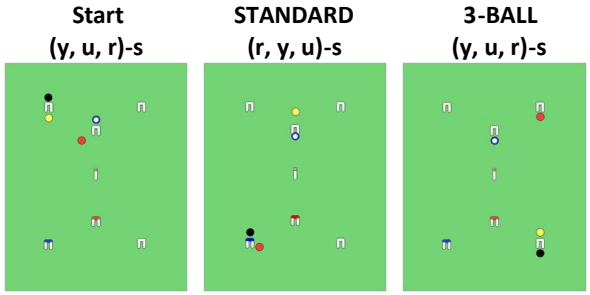
3-BALL: ***[R(i)→P(i+2)], [V(i)→R(i+1)], [P(i+1)→V(i+1)]****

Arithmetic: Starting with CO and FO in sync, 3-BALL involves only two non-Striker balls but moves all three of the balls two FS: R→P, V→R, and P→V. CO and FO start and remain sync.

[3] Note that TAC and 3-FIX cannot be played in either order!

Figure II.12 is taken from a peeling turn. Here k is Striker and is for h(7). y is R(7), u is V(7,11) and r is E(8,11). k is about to make h(7) and wants to peel u, the Pivot-Ball, at h(11) W-h(8), and then use r as an escape ball, rushing it to h(8).

Figure II.12: k makes h(7) and goes to y. k sends y from R(7) to V(8) – [CO is (y, u, r)] – as k goes to u. k attempts the peel at h(11), W-h(8), converting u from V(7,11) to M(9,11) as k goes to r. k rushes r from E(8,11) to P(8) and then croquets it to R(8) as k goes to position at h(8), Figure II.13, STANDARD. (*y was sent North of h(11) as a "Helper-Ball" that will be discussed later).*



This was a Transit-Peel completed using STANDARD with Peelee as the Pivot-Ball. As discussed above, STANDARD advances all balls one FS, converting the Pivot-Ball (Peelee) into the Pioneer-Ball for h(9), albeit misplaced near h(11), hence M(9,11). Having a Misplaced-Pioneer like this after a Transit-Peel is part and parcel of COAC and is a challenge under the best of conditions, [i.e., when the peel is clean and the former Peelee can be rushed from M(9,11) to h(9)]. But it is particularly awkward if the peel fails, if Peelee is in the jaws, or if Peelee just dribbles through and cannot be rushed to the next hoop. In this case, 3-BALL can come to the rescue.

Figure II.13: k makes h(8) and goes to r. k sends r from R(8) to P(10) – [CO is (r, y, u)] – as k goes to y. k rushes y from V(8) to P(9) and then croquets it to R(9) as k goes to position at h(9), Figure II.14, 3-BALL.

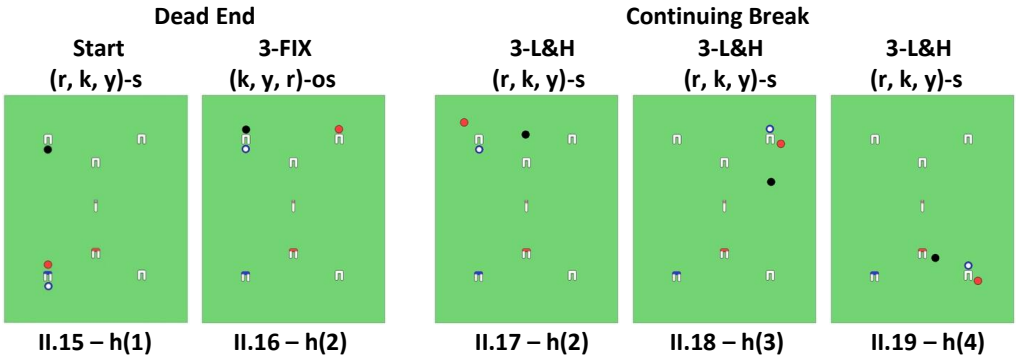
Here Striker intentionally ignores u, the Pioneer-Ball. Almost magically, and without being moved, u morphs from being the Pioneer-Ball to becoming the Pivot-Ball! This is a manifestation of 3-BALL wherein the next hoop is made with the Pivot-Ball instead of the Pioneer-Ball, even though the Pioneer-Ball is technically available.

Procedures with L&Hs

We use the term Load-and-Hold, "L&H" whenever the ball Striker uses just *before* making a hoop, h(i), is not the same as the ball he uses just *after* making that hoop. L&Hs add tremendous flexibility to how Striker can use/position the balls, but also increase the difficulties of maintaining a break. The length/difficulty of a L&H varies by Procedure and by the location of the balls on the lawn when the L&H is attempted.

3-L&H: *[R(i)→R(i+1)], [V(i)→V(i+1)]*, [P(i+1)→P(i+2)]*

Arithmetic: 3-L&H has Striker interact with just two non-Striker balls but moves all balls three FS: R→R, V→V, and P→P. The second ball, be it V or P, is moved with a L&H. The balls start in sync and remain in sync.



Suppose Striker (u) has access to r and k, but not y. This can happen during the opening of a COAC Game – perhaps k plays first, and r plays second. u will play next as the 3rd turn, without access to y. But e*ven though y is not in the game, y is part of the CO!*
This can happen at other points during a game, if the conditions are such that u chooses to ignore y.

u can deal with either of these situations in T-AC by running a 3-ball break – having r be the Pioneer/Reception-Ball at one hoop and k be the Pioneer/Reception ball at the next. This does not work in COAC if more than one hoop is involved – Striker will violate CO the first time he tries to go to r after using k, having not gone to y. The CO will be (r, k, y) or (k, y, r), depending upon which ball u goes to first after making a hoop, r or k. u can go to k after r, but not vice versa.

This is shown starting in Figure II.15. u is in position to make h(1). r is R(1) and k is P(2). y is not in the game. u makes h(1) and goes to r. u sends r from R(1) to P(3) – [CO is (r, k, y)] – as u goes to k. u roquets k and sends it from P(2) to R(2) as u goes to position at h(2), Figure II.16, 3-FIX. This is a dead end. u can make h(2) but, other than "2-balling" it to h(3), u cannot proceed.

Figures II.17 to II.19 show a 3-ball break that follows CO. The same ball – in this case r – is used as Reception at all hoops, and the same ball – in this case k – is used as the Pioneer at all next hoops. This is accomplished with a L&H involving k at each hoop and a rush to get it to P(i+1). Again, consider Figure II.15: u makes h(1) and goes to r. u sends r from R(1) to R(2) – [CO is (r, k, y)] – as u goes to k. This time, with a short L&H, u sends k to V(2) while going to position at h(2), Figure II.17, 3-L&H.

Figure II.17: u makes h(2) and goes to r. u sends r from R(2) to R(3) – [CO is (r, k, y)] – as u goes to k. Then, with a short L&H, u sends k from P(3) to P(4) while going to position at h(3), Figure II.18, 3-L&H.

Figure II.18: u makes h(3) and goes to r. u sends r from R(3) to R(4) – [CO is (r, k, y)] – as u goes to k. Then, with a short L&H, u sends k from P(4) to P(5) while going to position at h(4), Figure II.19, 3-L&H.

Striker can run a 3-ball break using L&Hs involving any two of the other three balls. The Pioneer-Ball – the ball that will be the croquet ball in the L&H – will be the ball that *precedes* the missing ball in CO.

Technically, 3-L&H can also be used to restore CO after a TAC, LIMITED or MYSTERY Procedure.

EXPEDITE: *[R(i)→P(i+2)], [V(i)→R(i+1)], [P(i+1)→V(i+1)]*

Arithmetic: Starting with CO and FO in sync, EXPEDITE moves the Functions of each of the three balls two steps forward: R→P, V→R, and P→V. The movement of P involves a L&H. CO and FO remain in sync [4].

Figure II.1: u makes h(1) and goes to r. u sends r from R(1) to P(3) – [CO is (r, k, y)] – as u goes to k. u sends k from V(1) to R(2) going to y. u sends y from P(2) to V(2) with a short L&H as u goes to position at h(2), Figure II.20, EXPEDITE.

Figure II.20: u makes h(2) and goes to k. u sends k from R(2) to V(3) – [CO is (k, y, r)] – as u goes to y. u sends y from V(2) to P(4) as u goes to r. u sends r from P(3) to R(3) as u goes to position at h(3), Figure II.21, STANDARD.

CO and FO are the same in Figures II.1 and II.21. This shows that combining EXPEDITE with one iteration of STANDARD repeats the CO and FO of the balls every two hoops. That is, the Arithmetic of [EXPEDITE + STANDARD] is to move all balls forward three FS – which returns them to their original functions and colors. This result is the same for [TAC + 3-FIX] (see Figures II.10 and II.11) with the added outcome that the Pivot-Ball is adjusted twice, which may or may not be useful.

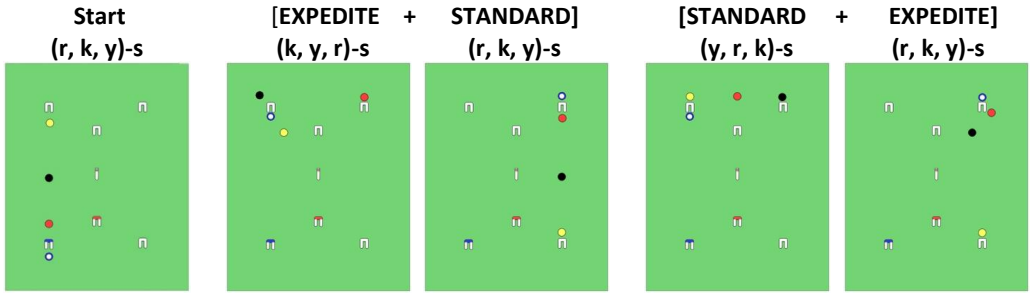


Figure II.20 and II.21 showed the result of [EXPEDITE + STANDARD]. Figures II.22 and II.23 show it for [STANDARD + EXPEDITE] illustrating that these Procedures can be used in either order and generate the same result (CO and FO) after two hoops.

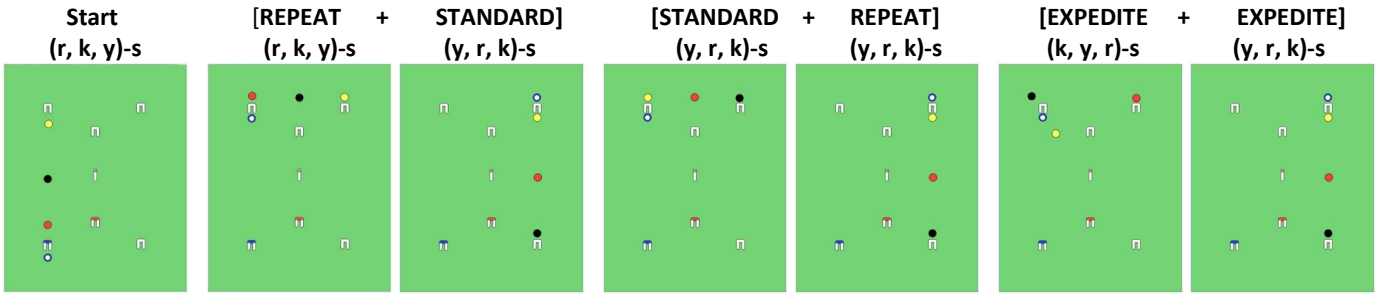
[4] The 3-BALL Procedure creates the same CO as does the EXPEDITE Procedure, but 3-BALL ignores the ball at P(i+1), which may or may not be helpful.

REPEAT: *[R(i)→R(i+1)], [V(i)→V(i+1)], [P(i+1)→P(i+2)]*

Arithmetic: Starting with CO and FO in sync, REPEAT moves each ball three FS, returning them to their original functions. R→R, V→V and P→P, with a L&H on P. This Procedure maintains the balls with unchanging CO and FO at each hoop – hence the name. *REPEAT is extremely useful when it is desirable to speed-up the peeling process by maintaining Peelee as the repeating Pivot-Ball.*

Figure II.1: u makes h(1) and goes to r. u sends r from R(1) to R(2) – [CO is (r, k, y)] – as r goes to k. u sends k from V(1) to V(2) as u goes to y. Then, with a long L&H, u sends y from P(2) to P(3) as u gains position at h(2), Figure II.24, REPEAT.

Figure II.24 REPEAT is often followed with STANDARD. u makes h(2) and goes to r. u sends r from R(2) to V(3) – [CO is (r, k, y)] – as r goes to k. u sends k from V(2) to P(4) as u goes to y. u sends y from P(3) to R(3) as u gains position at h(3), Figure II.25, STANDARD.



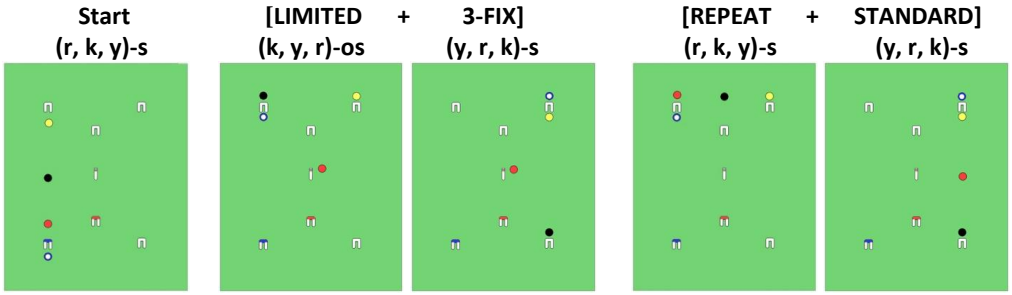
As was the case with [EXPEDITE and STANDARD], [REPEAT and STANDARD] can be executed in either order and obtain the same CO and FO – compare Figures II.24 and II.25 [REPEAT + STANDARD] to Figures II.26 and II.27 [STANDARD + REPEAT].

Figure II.28 is the result of an EXPEDITE applied to Figure II.1; Figure II.29 is the result of EXPEDITE applied to Figure II.28. Note that Figures II.25, II.27 and II.29 are identical. This establishes that [EXPEDITE + EXPEDITE] yields the same CO and FO as [REPEAT + STANDARD] or [STANDARD + REPEAT]. Practically speaking, this means that Striker can use two EXPEDITEs, instead of a REPEAT and a STANDARD, to reorient CO and FO as needed to peel or set leaves. This is very useful when Striker has two hoops available and the execution of [REPEAT + STANDARD], or vice versa, is problematic but [EXPEDITE + EXPEDITE] is possible.

Two Other 4-Ball Procedures: There are two other 4-ball Procedures that involve L&Hs. A couple of uses for the LIMITED Procedure have been found and are shown later; but none have been found for the MYSTERY Procedure!

LIMITED: ***[R(i)→V(i+1)], [V(i)→R(i+1)], [P(i+1)→P(i+2)]***

Arithmetic: Starting with CO and FO in sync, LIMITED moves R one FS →V, V two FS →R, and then, with a L&H, P three FS →P. Sync can be restored by an application of 3-FIX.



From Figure II.1: u makes h(1) and goes to r. u sends r from R(1) to V(2) – [CO is (r, k, y)] – as u goes to k. u sends k from V(1) to R(2) as u goes to y. Then, with a long L&H, u sends y from P(2) to P(3) as u goes to position at h(2), Figure II.30, LIMITED. Note: CO and FO are out of sync.

Figure II.30: u makes h(2) and goes to k. u sends k from R(2) to P(4) – [CO is (k, y, r))] – as u goes to y. u sends y from P(3) to R(3) as u goes to position at h(3), Figure II.31, 3-FIX.

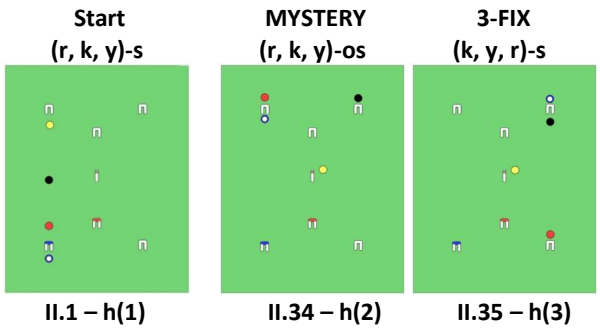
Note that [LIMITED + 3-FIX] = [REPEAT + STANDARD] as is shown by comparing Figures II.30 and II.31 to Figures II.32 and II.33. This equivalence has a particular application – when the h(10) peel fails A-h(3) and Striker wants is to be repeated W-h(6).

MYSTERY: *[R(i)→R(i+1)], [V(i)→P(i+2)],[P(i+1)→V(i+1)]*

Arithmetic: Starting with CO and FO in sync, MYSTERY moves R three FS →R, V one FS →P, and, with a L&H, P two FS to →V. CO and FO are not in sync. Sync can be restored by an application of 3-FIX.

Figure II.1: u makes h(1) and goes to r. u sends r from R(1) to R(2) – [CO is (r, k, y)] – as u goes to k. u sends k from V(1) to P(3) as u goes to y. Then, with a L&H, u sends y from P(2) to V(2) as u goes to position at h(2), Figure II.34, MYSTERY.

Figure II.34: u makes h(2) and goes to r. u sends r from R(2) to P(4) – [CO is (r, k, y))] – as u goes to k. u sends k from P(3) to R(3) as u goes to position at h(3), Figure II.35, 3-FIX.

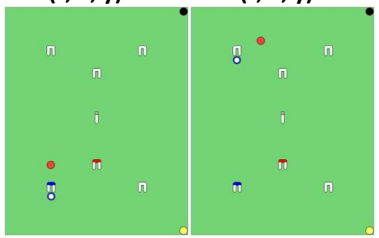


To date, no meaningful use for MYSTERY in COAC has been found!

2-BALL: *[R(i) →P(i+1)→R(i+1)], [V(i)→V(i+1)]*, [P(i+1)→P(i+2)]**

Arithmetic: 2-BALL makes the Current-Hoop – moving R three FS →R. V and P are not roqueted and maintain their Functions, now for the next hoop.

Figure II.39: u makes h(1) and goes to r. u rushes r from R(1) to P(2) and then sends it to R(2) – [CO is (r, k, y)] – while u goes to position at h(2), Figure II.40, 2-BALL.



II.39 – h(1) **II.40 – h(2)**

III.. THE ARITHMETIC OF CO

The Prior-Hoop Construct

Balls are often played at the start of a turn from distant areas of the lawn to the Current-Hoop. The lack of an initial Functional Structure can make it difficult to decide what Procedure to use and its impact on the break.

The "Prior-Hoop" Construct can help. Before starting a turn, imagine you are about to make a "hypothetical" hoop that is numbered one prior to your actual hoop. This works for all starts and at all hoops, but it is particularly useful when Striker is for h(1) and the Prior-Hoop is h(0), the 0th hoop. The Prior-Hoop Construct involves two steps that are outlined below, using h(0) as the example.

1. Determine the Order of Play: Mentally assign Functions to the balls relative to a hypothetical h(0): The 1st ball roqueted, *which may have been the only rational ball to shoot at*, is R(0). It determines the CO between h(0), your starting point, and h(1). The 2nd ball, if any, must follow in CO and will be V(0). The 3rd ball, if any, must again follow in CO and will be P(1). This order of play establishes [R(0), V(0), and P(1)].

2. Determine your Procedure: R(0), the 1st ball, can be sent to a position associated with any of the three Functions related to h(1) – [R(1), V(1), P(2)]. Then V(0), the 2nd ball, can be sent to either of the two remaining Functions, and P(1), the 3rd ball, will adopt the remaining unallocated Function. These transformations define a Procedure for play from h(0) to h(1).

Choosing [R(0), V(0), P(1)] is usually the easy part – the balls are where they are as you start a turn. What is not obvious is the best transformation from [R(0), V(0), P(1)] to [R(1), V(1), P(2)]. It is the Arithmetic of CO that helps determine how to proceed.

Answering COAC Questions

Suppose Striker is in position at h(i). What Procedure(s) should he use, so that when he is in position at h(i+j), (j hoops ahead) the balls will have the CO and FO he wants? This question can be answered in four steps *but only if CO and FO are in sync at h(i)!*

(i) Identify one of the non-Striker balls at h(i) as the Reference-Ball ("RB"). This ball will have a current Function – (R, V, or P) – name it "HAVE". *RB can be any of the balls but should be the one that makes the most intuitive sense to you under the circumstances. It is often Partner.*

(ii) Determine what Function the RB wants/needs to have after j hoops– (R, V, or P) – name it "WANT". The *RB is often chosen with WANT in mind. (e.g., I want Partner to be Pivot in j hoops so I can peel him on the way to the next hoop, etc.)*

(iii) Starting from HAVE, see what function you get by rotating j Functional Steps (FS) around the Functional Circle. Name this Function – "GET". Then make a mental note of the two Functions that follow GET in rotation – name them "GET+1" and "GET+2". The triad [GET, GET+1, GET+2] can be (R, V, P), (V, P, R) or (P, R, V). *GET is what you get in j hoops starting from HAVE and using only STANDARDs to proceed.*

(iv) Compare WANT to [GET, GET+1, GET+2] and carry-on using one of the three strategies identified below:

1. If WANT = GET : Make j hoops with STANDARD (or its equivalent).
2. If WANT = GET+1 : Make 1 hoop with EXPEDITE (or its equivalent) during the next j hoops and (j-1) with STANDARD.
3. If WANT = GET+2 : Make 1 hoop with REPEAT (or its equivalent) during the next j hoops and (j-1) with STANDARD.

Commented [BR1]: I forget why we need to specify this? Is this saying make all other hoops with standard or make the last hoop with standard?

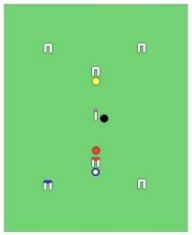
A Simplification when j>=3**.** The Functional Circle is a three-element repeating cycle. Moving one FS around it from any starting point has the same result as moving 4, 7 or 10; moving two FS is the same as moving 5, 8, or 11; and moving 3, 6, 9, or 12 FS is the same as moving zero FS. This cyclical concept is captured in the Modulo operator, abbreviated here as Mod(b:j) which is the remainder after dividing j by b, where b can be any "base" number. For COAC, b=3. Using Mod(3:j) will produce only one of three results: (0, 1, or 2). [e.g., Mod(3:4)=1, Mod(3:11)=2, and Mod(3:9)=0]. Therefore, you can determine what the GET Function is when it is more than three FS away by rotating around the Functional Circle Mod(3,j) FS instead of the full j units. Using Mod(3:j) simplifies the calculation such that it can be done easily and quickly out on the lawn, as you run your break.

Examples Involving Different COs and Different RBs: In Figures III.7, III.8, and III.9 u is in position to make h(5) with the non-Striker balls in sync. However, each has a different CO. The question is, in each case, using just one hoop, how can Striker progress to h(6) and have y be R(6), r be V(6) and k be P(7) [5], as shown in Figure III.10?

Let's do the Arithmetic: From Figure III.7: RB=r. u is for h(5). r is R(5), k is V(5), and y is P(6). Thus, HAVE=R. WANT=V. j=1. In one FS, HAVE will rotate from R to V→GET=V, GET+1=P, and GET+2=R. WANT=GET. We need to make one hoop with STANDARD.

Figure III.7: u makes h(5) and goes to r. u sends r from R(5) to V(6) – [CO is (r, k, y)] – as u goes to k. u sends k from V(5) to P(7) as u goes to y. u sends y from P(6) to R(6) as u goes to position at h(6), Figure III.10, STANDARD.

Same Starting Hoop, Different Functional Roles for k and Different RB's

STANDARD (r, k, y)-s	EXPEDITE (k, y, r)-s	REPEAT (y, r, k)-s	RESULT (y, r, k)-s
			
III.7 – h(5)	**III.8 – h(5)**	**III.9 – h(5)**	**III.10 – h(6)**

Let's do the Arithmetic: From Figure III.8: RB=k. u is for h(5). k is R(5), y is V(5), and r is P(6). Thus, HAVE=R. This time WANT=P. In one FS, HAVE will rotate from R to V→GET=V, GET+1=P, and GET+2=R. WANT=GET+1. We need one hoop with EXPEDITE.

Figure III.8: u makes h(5) and goes to k. u sends k from R(5) to P(7) – [CO is (k, y, r)] – as u goes to y. u sends y from V(5) to R(6) as u goes to r. Then, with a short L&H, u sends r from P(6) to V(6) as u goes to position at h(6), Figure III.10, EXPEDITE.

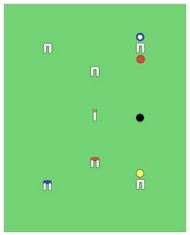
[5] It turns out that Striker will have an easy time setting a DSL if he can reach the position shown in Figure III.10, which is why we use it in these examples. All striker needs to do is to execute 4 STANDARDs.

Let's do the Arithmetic: From Figure III.9: RB=y. u is for h(5). y is R(5), r is V(5), and k is P(6). Thus, HAVE=R. This time WANT=R. In one FS, HAVE will rotate from R to V→GET=V, GET+1=P, and GET+2=R. WANT=GET+2. We need to make one hoop with REPEAT.

Figure III.9: u makes h(5) and goes to y. u sends y from R(5) to R(6) – [CO is (y, r, k)] – as u goes to r. u sends r from V(5) to V(6) as u goes to k. Then, with a short L&H, u sends k from P(6) to P(7) as u goes to position at h(6), Figure III.10, REPEAT.

Examples with Varying j's, when the RB Remains Partner (k): We want to reach Figure III.10, this time from Figures III.11, III.12, and III.13. We will describe the thought process – the Arithmetic – but dispense with details that implement the chosen Procedures.

Keeping k as the RB

STANDARD	REPEAT	EXPEDITE	Result
(k, y, r)-s	(y, r, k)-s	(r, k, y)-s	(y, r, k)-s
			
III.11 – h(1)	III.12 – h(2)	III.13 – h(3)	III.10 – h(6)

Let's do the Arithmetic: From Figure III.11: RB=k. u is for h(1). k is R(1), y is V(1) and r is P(2). Thus, HAVE=R. We are looking j=5 hoops ahead, at h(6) where WANT=P. Mod(3,j)=Mod(3,5)=2, thus going from HAVE to GET in five FS is the same as determining what is needed in two FS. In two FS, HAVE will rotate from R to P→GET=P, GET+1=R, and GET+2=V. WANT=GET. Therefore, over the next five hoops Striker can exclusively use STANDARDs.

Let's do the Arithmetic: From Figure III.12: RB=k. u is for h(2). y is R(2), r is V(2), and k is P(3). Thus, HAVE=P. We are looking j=4 hoops ahead at h(6) where WANT=P. Mod(3,j)=Mod(3,4)=1. In one FS, HAVE will rotate from P to R→GET=R, GET+1=V and GET+2=P. WANT=GET+2, therefore over the next 4 hoops Striker should make 1 hoop with REPEAT and 3 with STANDARDs.

Let's do the Arithmetic: From Figure III.13: RB=k. u is for h(3), r is R(3), k is V(3), and y is P(4). Thus, HAVE=V. We are looking j=3 hoops ahead at h(6) where WANT=P. Mod(3,j)=Mod(3,3)=0 implying that determining how HAVE will rotate over three FS is the same as determining what happens over zero FS. In zero FS, HAVE will still be V→GET=V, GET+1=P and GET+2=R. WANT=GET+1, and, therefore, over the next three hoops Striker should make one hoop with EXPEDITE and two with STANDARDs.

Timing Corrective Action: In the first three examples presented above, u was for h(5) and had to act immediately because the goal was to reach the desired CO and FO in just one hoop, by h(6). Things were different in the last three examples. Here u knew *what* he had to do but had the freedom to choose *when* to do it. That is, if j>= 2, then Striker has two or more hoops available to reach his goal. STANDARD, EXPEDITE, and REPEAT are commutative meaning they can be executed in any order achieving the same result. This means that a difficult EXPEDITE or REPEAT can be delayed to a more convenient hoop by starting with one or more STANDARDs. In addition to timing corrective actions, the precise actions taken do not have to follow the precise prescription of the Arithmetic which uses only STANDARDs, EXPEDITEs, and REPEATs – equivalents are possible and, if used, often improve the situation.

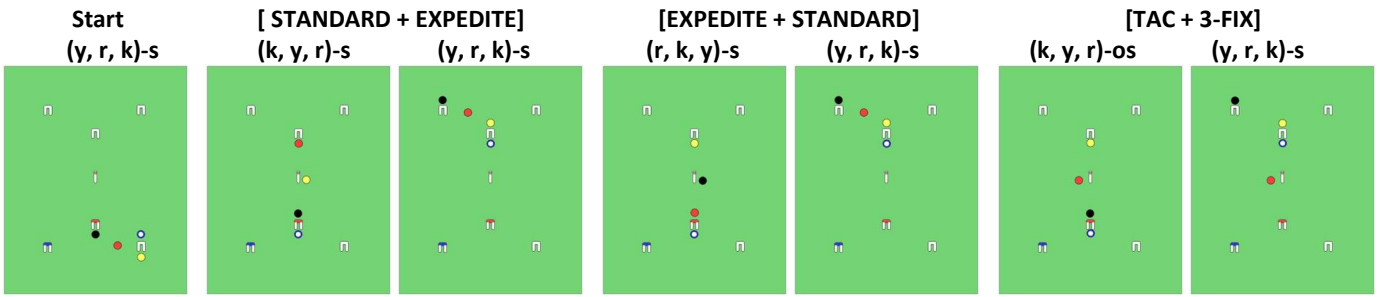
From Figure III.12, u is for h(2) and needs to do a REPEAT before making h(6). The easiest REPEAT would be between h(3) and h(4), approaching h(4) with a short L&H and therefore Striker should execute one STANDARD, one REPEAT and then two STANDARDs. Between h(5) and h(6) would be similarly short, but it is wise to leave some room (hoops) for error.

From Figure III.13, u is for h(3) and needs to do an EXPEDITE before making h(6). It is probably easiest to do it immediately, before h(4), and follow with 2 applications of STANDARD.

Gaining Flexibility using Equivalences: The most useful Equivalences (others are available in the main book) are:

1. [EXPEDITE + EXPEDITE] = [REPEAT + STANDARD]
2. [TAC + 3-FIX] = [EXPEDITE + STANDARD]
3. [LIMITED + 3-FIX] = [REPEAT + STANDARD]
4. [REPEAT + REPEAT] = [EXPEDITE + STANDARD]

Note also that 3-BALL creates the same CO as EXPEDITE but ignores the ball at P(i+1), which may or may not be helpful. Finally, 3-L&H and 2-BALL and can be used in lieu of REPEAT in some circumstances when ignoring the unused ball(s) proves useful.
We start in Figure III.14 with the desire to reach Figure III.16.



Let's do the Arithmetic: From Figure III.14: u is for h(4), y is R(4), r is V(4), and k is P(5). RB=k. Thus, HAVE=P. We are looking j=2 hoops ahead to h(6) where we want k to be P(7), thus, WANT=P. In (j=2) FS, HAVE will rotate from P to V→GET=V, GET+1=P and GET+2=R. WANT=GET+1, and, therefore, over the next two hoops, Striker should make one hoop with EXPEDITE and one with STANDARD, in either order, or the equivalent.

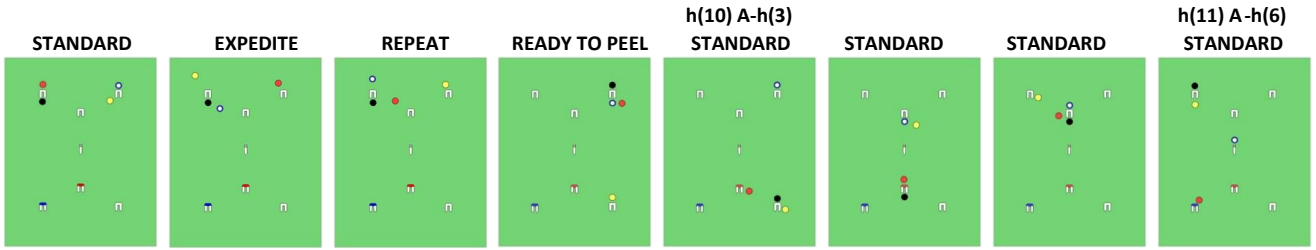
Figures III.15 and III.16 show the result of [STANDARD + EXPEDITE] while Figures III.17 and III.18 show the result of [EXPEDITE + STANDARD]. No surprise, the results are the same. Furthermore, if, for some reason, we decided to do the arithmetic again one hoop later, after Figures III.15 or III.17 we would be instructed to do what was done between Figures III.15 and III.16 – an EXPEDITE, or between Figures III.17 and III.18 – a STANDARD, as shown in the two calculations below:

Let's do the Arithmetic: From Figure III.15: u is for h(5), k is R(5), y is V(5), and r is P(6). RB=k. Thus, HAVE=R. We are looking j=1 hoop ahead at h(6) where we want k to be P(7), thus, WANT=P. In (j=1) FS, HAVE will rotate from R to V→GET=V, GET+1=P and GET+2=R. WANT=GET+1, and, therefore, to get to the next hoop, Striker should execute an EXPEDITE.

Let's do the Arithmetic: From Figure III.17: u is for h(5), r is R(5), k is V(5), and y is P(6). RB=k. Thus, HAVE=V. We are looking j=1 hoop ahead at h(6) where we want k to be P(7), thus, WANT=P. In one (j=1) FS, HAVE will rotate from V to P→GET=P, GET+1=R and GET+2=V. WANT=GET, and, therefore, to get to the next hoop, Striker should execute a STANDARD.

XIII: PEELING TURNS AND LEAVES

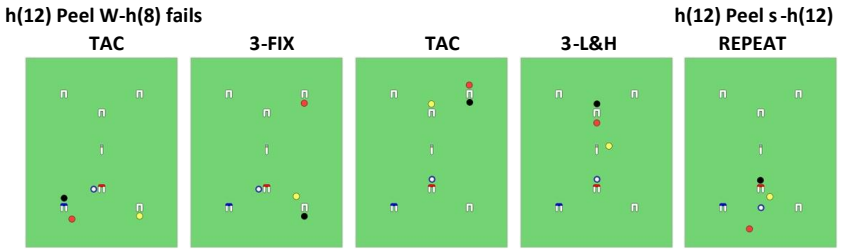
THE STANDARD-TRIPLE



XIII.1 (r, y, u) XIII.2 (y, u, r) XIII.3 (u, r, y) XIII.4 – h(3) XIII.5 – h(4) XIII.6 – h(5) XIII.7 – h(6) XIII.8 – h(7)

Suppose k is Striker at h(2). This is one hoop before the Back-Peel desired in a Standard Triple. Each of the 3 in-sync COs shown in Figures XIII.1 – XIII.3 sets-up for the Peel h(10) A-h(3), Figure XIII.4, using the Procedure listed *above* the relevant figure. Then one STANDARD completes the 1st Peel, Figure XIII.5, and three more complete the 2nd Peel, h(11) A-h(6), Figures XIII.6 – XIII.8.

The h(12) Peel: In T-AC this Peel can be tried W-h(8) but is usually done W-h(9). In COAC W-h(9) requires back-to-back REPEATs from h(7) – including an effort toward Peeling W-h(8) – which is pretty risky for a Striker who is "on-time." We prefer to have k get to h(8) using TAC and attempt the h(12) Peel W-h(8) along the way. If the Peel gets done, then great! The finish (not shown) is easy.

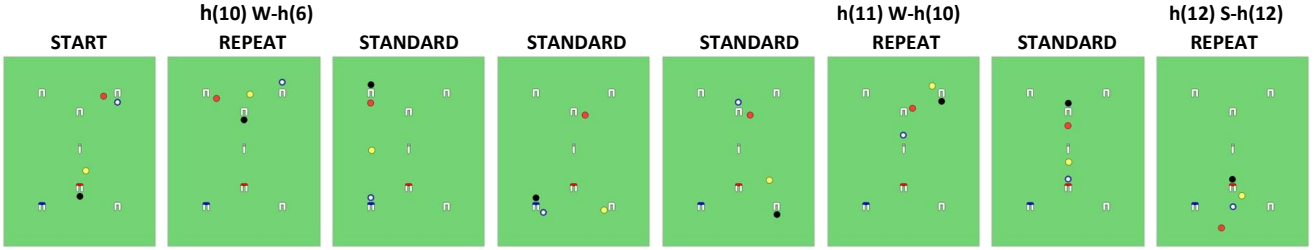


XIII.9 – h(8) XIII.10 – h(9) XIII.11 – h(10) XIII.12 – h(11) XIII.13 – h(12)

If the Peel fails, Figure XIII.9, then Striker will be at a decision point. He will use 3-FIX to restore CO but will have a choice of sending r to E(10,12) to set-up for the attempt at the h(12) Peel W-h(10), or sending r to P(10) in advance of a Straight-Peel at h(12) S-h(12). We recommend and show the latter, having k do this using TAC, Figure XIII.10. k makes h(9), sends y to h(11), adjusts u at h(12), and proceeds to r at h(10) once again using TAC, Figure XIII.11. Striker progresses to h(11) using 3-L&H, Figure XIII.12, restoring the desired CO. Finally, the h(12) Peel is completed S-h(12) using REPEAT, Figure XIII.13, with a standard peg-out to follow.

The Delayed-Triple-Peel: h(10) Peeled W-h(6)

We have k start at h(5), Figure XIII.14, set-up to try the h(10) Peel W-h(6). In T-AC, y is usually sent to P(7), but in COAC it is sent to R(6) with a REPEAT. Suppose the Peel attempt succeeds, Figure XIII.15. *This is the decision point*! One way to proceed, often done in T-AC, is to send u to P(8). This also works well in COAC, using a STANDARD to reach Figure XIII.16. This step is made easier if, once the Peel succeeds W-h(6), then from Figure XIII.14, r is sent with a short L&H toward P(7), Figure XIII.15.



Then k uses two STANDARDs to set-up a classic Delayed-Double, Figures XIII.17 and XIII.18, with a risk-free chance to complete the h(11) Peel A-h(8). A REPEAT completes the h(11) Peel W-h(10) and allows access to y after h(10), Figure XIII.19. A STANDARD is used to reach h(11), Figure XIII.20 and a REPEAT to complete the h(12) Peel S-h(12) and to set-up for the peg-out to follow, Figure XIII.21.

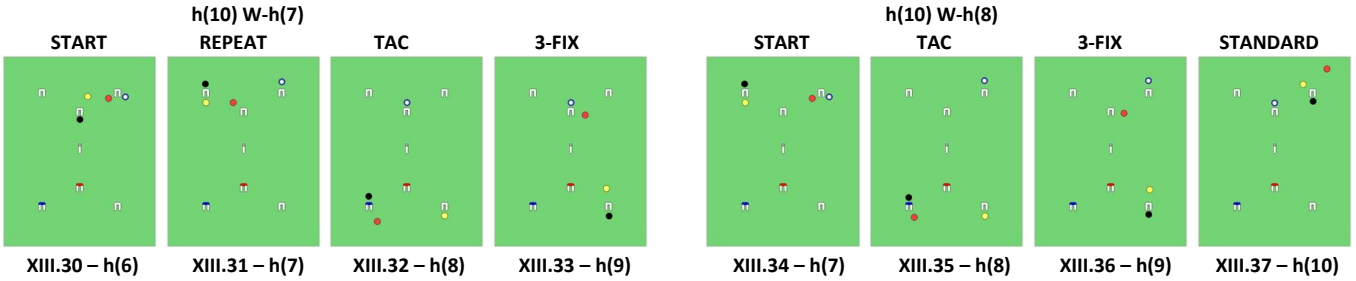
It is also possible, but not recommended, to set up for the h(11) Peel W-h(8) or W-h(9). For details see the description starting on page 152 of the original book.

"Delayed"-Triples : h(10) Peeled W-h(7), W-h(8) or Later

h(10) Peeled W-h(7): Figure XIII.30 shows the W-h(6) Peel failing, then succeeding W-h(7), REPEAT, Figure XIII.31. The key play to h(8) is using TAC to send y "toward" h(9), getting u "toward" Peel position at h(11), *and for sure* (!) getting a good rush on r to h(8), Figure XIII.32.

r is shown in Figure XIII.31 positioned north of where it would be if Striker wanted to try the Peel W-h(7). This attempt is abandoned to get a better rush on r to h(8). TAC takes the balls out of CO. Striker "burns a hoop" restoring CO using 3-FIX, Figure XIII.33, and proceeds with a Delayed-Double.

h(10) Peeled W-h(8): Figure XIII.34 shows the Peel at h(10) W-h(7) failing, then succeeding W-h(8), Figure XIII.35. Striker used TAC for the Peel (REPEAT here is unrealistic!) and the escape to h(8). Again, Striker must burn a hoop with 3-FIX to restore CO, Figure XIII.36. It is still possible to complete the h(11) Peel W-h(10) as part of a Delayed-Double, but the Peel must be completed in one hoop – HP – k rushes y to the north boundary gaining a rush on u to h(11) and then k tries the peel going to r. Striker will know if the Peel has failed before rushing r and should use STANDARD instead of REPEAT if it fails, so that Striker can go first to r and then to y before rushing u to h(11), in a Straight-Double, Figure XIII.37.

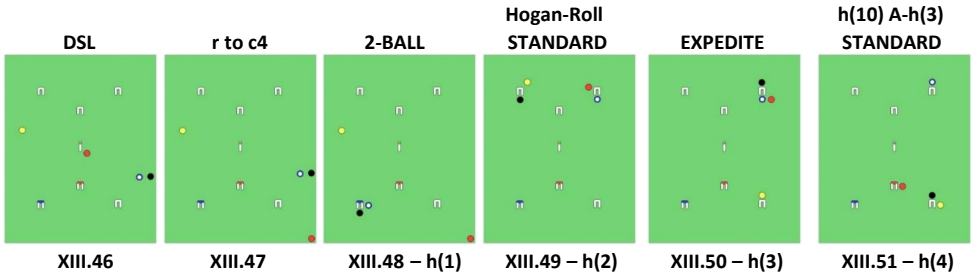


The **h(10) Peeled W-h(9)** is a rare occurrence. It can be followed by a fortunate Delayed-Double by peeling **h(11) W-h(10)**, but more typically a Straight-Double is needed. Breaking-down in either case grants contact, assuming h(10) is made. If you end up attempting the **h(10) Peel W-h(10)**, then you are in for a Straight-Triple attempt, giving contact if it fails.

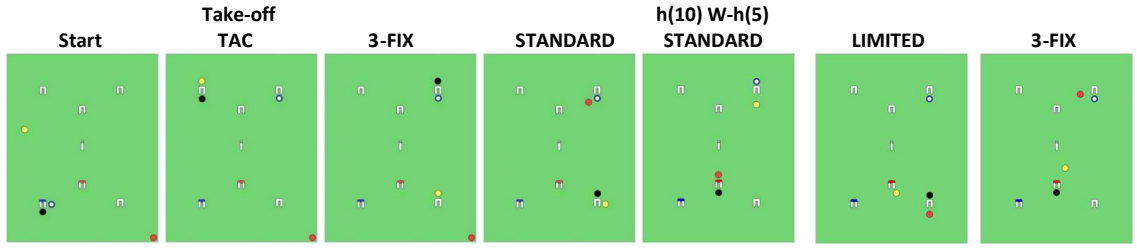
SETTING AND PLAYING FROM A DSL

Figures XIII.38 – XIII.40 show three in-sync COs at h(5) with u as Striker. In each case, the Procedure listed above the figure can be used to set the stage for a DSL by moving the balls to the positions shown at h(6), Figure XIII.41. From here, four Standards yield a DSL. k will take over as Striker if r/y miss. Note two things: (i) With k as Striker, COAC has the ball at the peg as the After-Partner ball (r) and the ball toward h(2) as the Before-Partner ball y; and (ii) k has a rush on u to h(1) not to r (to avoid r finessing to c3).

If r shoots and k is ok with Hogan-Rolls: From a DSL, Figure XIII.46 and a miss by r to c4, Figure XIII.47, k can 2-BALL to h(1), Figure XIII.48, Hogan-Roll in a STANDARD to h(2), Figure XIII.49, EXPEDITE to h(3) to set-up the h(10) Peel A-h(3), Figure XIII.50, complete it with a STANDARD, Figure XIII.51, and then continue as discussed earlier.

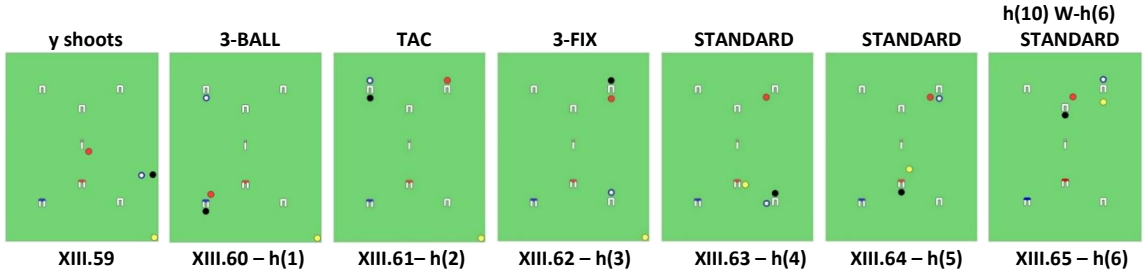


If k is not ok with Hogan-Rolls: k has two choices: (i) k can complete the h(10) Peel W-h(5) and rejoin a Standard-Triple by completing the h(11) Peel A-h(6). From Figure XIII.52, k makes h(1), sends u to h(3) going to r, takes-off from r to y and sets-up at h(2), Figure XIII.53, using TAC. 3-FIX takes k to h(3) and restores CO while sending y to P(4), Figure XIII.54. k makes h(3), leave u at h(10), takes off to r, sends r to E(5,10), and sets up with y at h(4), STANDARD, Figure XIII.55. The h(10) Peel A-h(5) follows with a STANDARD, Figure XIII.56. One more STANDARD (not shown) will suffice to complete the h(11) Peel A-h(6). (ii) In the alternative, k can choose to abandon a Standard and join a Delayed-Triple. Here, k proceeds from Figure XIII.54 to Figure XIII.57 using LIMITED and then 3-FIX to maneuver the balls into position for the h(10) Peel W-h(6), Figure XIII.58.



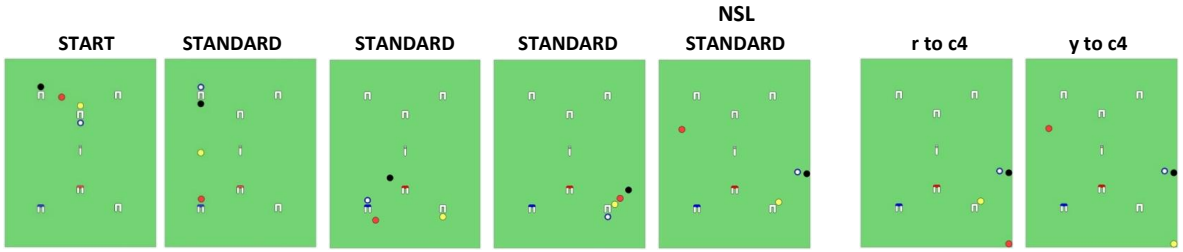
If y Shoots to c4: k will usually settle for a Delayed-Triple as the Standard requires a difficult full-roll sending y to R(2) from c4.

For the Delayed, after y misses into c4, Figure XIII.59, k will use 3-BALL to progress to h(1), leaving y in c4, Figure XIII.60. TAC progress k to h(2), again leaving y in c4, Figure XIII.61. 3-FIX moves k to h(3), restoring CO but still leaving y in c4, Figure XIII.62. Then three STANDARDS can be used to complete the h(10) Peel W-h(6), Figures XIII.63 – XIII.65.



SETTING AND PLAYING FROM AN NSL

If k will be the Striker running the Peeling turn, then in COAC, an NSL can lead to a Standard-Triple if y is hampered at h(4), Figure XIII.69 – not so if r is at h(4), not shown. The starting point of the DSL discussed above, Figure XIII.41, is repeated as the starting point of the NSL. Again, four STANDARDs produce the desired result, Figures XIII.66 – XIII.69. Note that k's rush on u is directed toward h(2) not h(1).



If r shoots and misses to c4, Figure XIII.70, then k taps u, goes to r, sends r back to P(2), makes h(1) with y, starting a Standard-Triple. If y shoots and misses to c4, Figure XIII.71, then k will rush u to h(2) and take r to h(1), with a Delayed-Triple in the sights.

X.. OPENINGS

The goal in COAC is the same as in T-AC – to secure the first break. However, the CO rule applies from the play of the 1st ball. In particular, it applies to the 3rd ball even before the 4th ball enters the game. This means that:

(i) The team playing 2nd gets to choose the color of that ball, which dramatically alters how, or if, the 3rd ball can start a 3-Ball break.

(ii) The mechanics of running a 3-ball break are more difficult. L&Hs are required at each hoop such that only one ball is used as Reception, while the other ball is used (with a L&H) as the Pioneer, (i.e., the 3-L&H Procedure).

Together these influences reduce the benefit of going first, putting increased emphasis on 4th, 5th, and 6th turns.

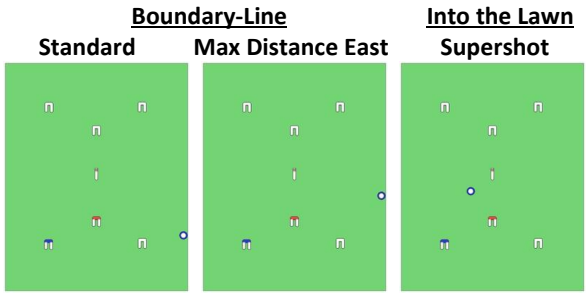
The 1st Ball: In and of itself, the color of the 1st ball is irrelevant (we use u). This is because the team that plays second can play a ball that is either before or after the color of the 1st ball as defined by the CO rule.

In T-AC, it is standard for the 1st ball to play to a distance greater than the prevailing CD. This often encourages the next player to set a tice. We now turn to COAC. We will assume initially that whatever u chooses to do, its resulting distance from the baulk lines is greater than the prevailing CD. Then, later we will relax this assumption.

The Panel of Figures below shows the two basic options available to the 1st ball:

(i) **u can play to a boundary:** usually shooting to the east boundary, level with, or just north of, h(4) – the Standard Opening, Figure X.1, or to a Maximum Distance point, Figure X.2, usually on the east boundary – Max Distance East. Or,

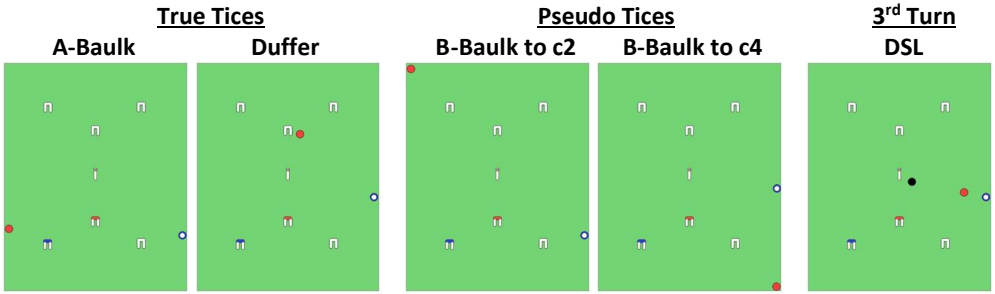
(ii) **u can play into the lawn**: as in a Supershot opening, Figure X.3.



2nd Ball Tices Played Against Boundary-Line Openings, and the 3rd Ball's Response: Often, r/y will play the 2nd ball to a tice position against a Boundary-Line 1st ball played by u in a T-AC game. Failure to do so allows the 3rd ball (k) to lag to or shoot at u, usually leaving the 4th ball only shots that have less than a 50/50 chance of hitting, and, thus, a less than 50/50 chance of winning the opening and getting the first break.

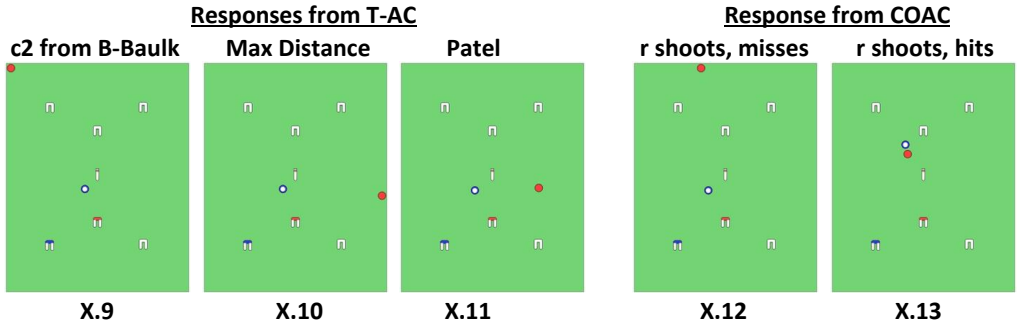
Popular tices are the A-Baulk and the Duffer Tices, Figures X.4 and X.5. These are set at the CD, or slightly shorter, to provide true enticements for the 3rd ball to shoot at them. Other possibilities include shooting from B-Baulk to just south of c2, Figure X.6, or shooting at a ball on the east boundary ball from B-Baulk and ending near c4 if it misses, Figure X.7. For top players, the balls near c2 and c4 represent true tices, although it is very rare for the turn-3 player to shoot at the c2 ball. For many players they are pseudo ("vanity") tices that are beyond their CD.

A 2nd turn tice places a ball at a shorter distance from the baulk lines than the 1st ball. This encourages the 3rd ball to shoot at it. In T-AC, the prize, hitting the tice, can lead to a 3rd turn break, or to setting the equivalent of a DSL as shown in Figure X.8, now with all balls beyond the CD – leaves of this nature are often referred to as "Dream Leaves". However, in COAC, the team that plays second (r/y) can limit the benefit of hitting the tice to just the 3rd Turn DSL. r/y does this by choosing the color of the tice ball to be (r) the AFTER-Partner-Ball when considered from the perspective of the 3rd ball, k, where u is his Partner. k can hit r, but k cannot then hit u because r is after u in CO.



It is theoretically possible to start and run a 9-hoop break with k hitting r. k needs to make h(1) and then run a 2-ball break with r until k can make a hoop and hit u. Then k can continue with a 3-Ball break with 3-L&Hs at each hoop. Getting this done is difficult. For the purposes of this chapter, we have discounted this possibility. Thus, u/k and r/y both believe that u/k cannot, and therefore will not, attempt a 3-ball break to start a COAC game.

2nd Ball Responses to the Supershot Opening: Figures X.9, X.10 and X.11 show the three classic T-AC responses to the Supershot: (i) Shooting just south of c2, (ii) Shooting to Max Distance on the east or (iii) Shooting to a position popularized by Samir Patel that is in lawn, between h(3) and h(4). These are all available in COAC and should once again be done with r (and not y) to prevent k from having any chance of getting started. In each case, if k shoots at r and misses, then he can leave a double target for y.

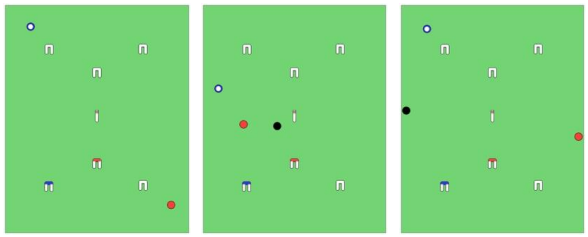


Figures X.12 and X.13 show two outcomes from another possible play by r/y – r shoots at u from A-Baulk. Before considering the benefit of this strategy, let's consider the cost. From Figure X.12, under COAC rules, k will hit r, but in all likelihood, the best k can do is set a 3-Ducks-style leave centered around u, which is a dead ball for k after it roquets r. y will be left with a less than 50/50 chance to win the opening.

The 2nd Ball Shoots and Hits the 1st Ball: It is rare to see the 2nd Ball shoot at the 1st in a T-AC game. With the introduction of CO, the 2nd ball shooting at the 1st has merit. Consider what can happen if r (or y) hits u. There are two continuations:

The first was suggested by Chris Clarke (for T-AC): *"… why not send U to 2-3 yards ESE of corner II and play R 3 yards west of IV, giving Oppos a choice of 10 yarders but no break?" Ibid. page 41.* This outcome is even better in COAC – r/y gets to determine the position of the ball that k will shoot at first, presuming k wants to move both balls away from the baulk lines following CO.

Figure X.14: **Clarke's Leave**. It is k to play. k needs to move both u and r away from their nearby baulk-lines to avoid giving y a 10 yarder and perhaps the first break. k could attempt to make h(1) with u directly, or with r after going to u. These are aggressive plays, that are unlikely to lead to a 3rd turn break. It is better for k to: (i) roquet u, (ii) use a thick take-off or a pass-roll to move u away from B-Baulk as k goes to r, (iii) send r to u, and (iv) go to u to complete a 3-Ducks leave, as shown in Figure X.15. *Note however that achieving this leave requires an extremely large pass-roll shot, which may not be in the armory of most players.*



X.14 **X.15** **X.16**

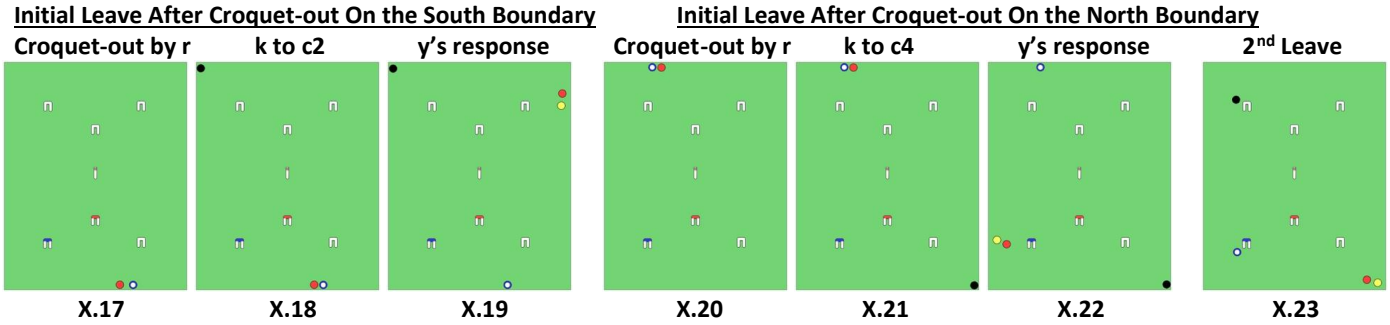
Success here will leave y without a 50/50 shot, and should, on average, cause r/y to lose the opening. If Striker hits u but is unable to move u far enough away from B-Baulk, then k should still go to r and move it away from A-Baulk, separate itself from both u and r as

much as possible, and orient the CO of the balls such that getting going by y should be difficult, perhaps as shown in Figure X.16. The 4th Ball y should be able to gain the innings for r/y by hitting u, but usually will not get started and will set a leave instead.

Figure X.17**:** This is a new possibility created by the CO rule. The 2nd ball, r, hits u. Then r "croquets-out", sending u and r out on the south boundary, just east of the end of A-Baulk, Figure X.17, with a particular orientation – r is to the west of u. An equivalent of this outcome can be engineered on the north boundary, Figure X.20 [6].

Play by the 3rd ball k: k has easy access to r from the end of A-Baulk, but r blocks k's access to u. To establish a break, CO would have k go to u first and then to r, but this is impossible unless k jumps r to hit u, or k hits u from B-Baulk. Of these, the jump shot [7] is probably more likely to succeed than is the shot from the distant baulk. The best response for k may be to finesse, have k shoot to just south of c2, Figure X.18, or just north of c4, Figure X.21. This turns the problem over to y.

Play by the 4th ball y: y has easy access to r, but then going from r to k and back to u to make h(1) seems like a lot of effort, that is not likely to bear fruit. In an ideal world, y as the 4th ball, would maneuver the balls away from their given positions to something like that shown in Figure X.23. However, getting this done in one turn is difficult in CO.



[6] It can be created at either baulk using y (switching the positions of y and u on the boundary). However, play by y usually involves needless risk.

[7] The possibility of jumping makes the positioning of the balls on the baulk line even more important. Further from the end of the baulk is better, as is having the two balls close together to require a more accurate jump.

Better for y is to set a leave as shown in Figures X.19 and X.22. In Figure X.19, r's rush on y is aimed to u but could be cut to h(1) or c4 if u relocates. In Figure X.22, y's rush on r is aimed at h(1) with the possibility rushing to k. It is u/k to play [8]. The rationale for these leaves was explained in the discussion in Chapter V in the main book on Two-Turn Leaves.

Figures X.19 and X.22 are the initial leaves in what r/y hope will become Two Turn Leaves. These are set in advance of setting a stronger leave, presuming that team u/k does not hit-in. No matter where u/k finesses, r/y should be able to set another leave that has the properties of Figure X.23, now achieved one turn later.

We believe r/y have an advantage if they hit on 2nd turn.

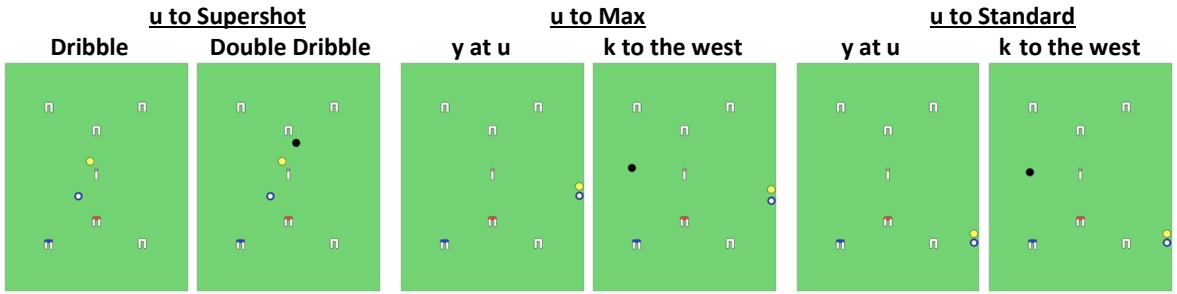
5th Turn and Beyond: Under our assumptions, k had no chance for a 3rd turn break, and r/y had no real opportunity for a 4th turn. Possibilities for both teams really begin with 5th Turn, from Figure X.19. k or u hitting anything is likely to win u/k the innings but lead to another leave; k or u shooting at any other ball and missing should give r/y a chance of getting

Plays Involving the BEFORE-Partner-Ball (y): We had u plays first to start the game. So far, all 2nd ball responses have been by r. Now we consider the play by y.

In Figure X.24, u plays a Supershot, and y follows by dribbling at u. If y hits u, then y can croquet-out or set the Clarke Leave, as discussed above. If y misses, then it should aim to end close to the peg. It is k to play. k probably has a double with u and y, but his only real interest is hitting y which may be more difficult with u where it is. k can try to dribble and hit y, Figure X.25. (This can be done from either baulk but here it was shown being attempted from A-Baulk). If k shoots and misses, then r should have a triple target! k's other possibility is to shoot near to y but not give another double. r will have to be satisfied with the original double formed by u and y. The risk in this strategy is that k hits y and runs a 3-ball break that could have been avoided by playing r.

In Figure X.26, u goes to Max Distance East and y shoots at u from the end of A-Baulk. If y hits in, then y can once again set the Clarke Leave or croquet-out. If y misses, then he will leave a double for k. But if k misses, then he will leave more than a double for r. Therefore, in Figure X.27, k chooses to go to a position that is useful as a pioneer for h(1). Assuming the 4th ball (r) misses, then u plays. u hits y onto the lawn a bit and takes off to r. In order to develop a break, u would roll r to P(2) while going to k to make h(1).

[8] This r/y preference for the North or South boundary depends on which of these leaves they can accomplish and then on which one they prefer.



r/y choose to play y and not r in this instance to prevent k from simply going between the peg and u to arrange an easy build for u if r were to miss the double target from B-Baulk.

In Figure X.28, u goes East of h(4) instead of Max Distance East and y missed, but the scenario is nearly identical to Figure X.26. k responds similarly and leaves a decent P(1), Figure X.29. It is unlikely that r (or k) has a double from A-Baulk, but one can be manufactured with appropriate placement on B-Baulk. In this scenario r chooses between a single ball 15-yard shot or a 25-yard double target. We think this is a better scenario for u/k than in Figure X.27.