



## Working Group 3 Institutional Marksmanship

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### Annual Rifle Qualification (ARQ)

Gunner Costa, MPMS  
WTBn, Quantico, VA  
October 2020  
FY21 CMS



# Agenda



**ARQ Phase II testing results**

**ARQ comparison to ART Tables**

**Night engagements**

**Target/barricade availability**

**Site specific issues**

**Equipment issues**

**ARQ implementation plan**



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# ARQ Phase II testing results



# Course of Fire



ARQ DAY 1 HOLDS						
RANGE	DRILL	ROUNDS PER ITERATION	TIME (sec)	POSITION(S)	ITERATION	TOTAL ROUNDS
<b>CONFIRMATION FIRE</b>						
100	ZERO CONFIRMATION	5	60	PRONE	3	15
<b>SHORT BAY</b>						
25	HEAD SHOT	1	3	STANDING	3	3
25	FAILURE TO STOP	3	5	STANDING	2	6
25	BOX	6	10	STANDING	1	6
25-15	FAILURE TO STOP/ MOVING	3	15	STANDING	1	3
100	HOLDS (BARRICADES)	5	60	SUPPORTED	3	15
100	MOVERS (BARRICADES)	2	8	STAND X 2, KNEE X2	4	8
<b>LONG BAY</b>						
200	HOLDS (BARRICADES)	5	60	SUPPORTED	3	15
200	MOVERS (BARRICADES)	2	8	STAND X 2, KNEE X2	4	8
300	HOLDS	5	60	SUPPORTED	3	15
500	HOLDS	5	60	SUPPORTED	3	15
<b>NIGHT</b>						
100	CONFIRMATION (BARRICADES)	5	60	STANDING	1	5
100	MOVERS (BARRICADES)	2	8	STAND X 2, KNEE X2	4	8
25	HEAD SHOT	1	3	STANDING	3	3
25	FAILURE TO STOP	3	5	STANDING	2	6
25	BOX	6	10	STANDING	1	6
25-15	FAILURE TO STOP/ MOVING	3	15	STANDING	1	3
					<b>TOTAL DAY 1=</b>	<b>140</b>

ARQ DAY 2/3 QUALIFICATION						
RANGE	DRILL	ROUNDS PER ITERATION	TIME (sec)	POSITION(S)	ITERATION	TOTAL ROUNDS
<b>LONG BAY</b>						
500	SUSTAINED FIRE	5	45	PRONE	8	40
300	CONTROLLED PAIR	2	15	STAND, KNEE OR PRONE	8	16
200	CONTROLLED PAIR (BARRICADES)	2	10	STAND, KNEE	6	12
200	MOVERS (BARRICADES)	2	8	STAND, KNEE	6	12
<b>SHORT BAY</b>						
100	CONTROLLED PAIR (BARRICADES)	2	8	STAND, KNEE	4	8
100	MOVERS (BARRICADES)	2	8	STAND, KNEE	4	8
25	HEAD SHOT	1	3	STANDING	3	3
25	FAILURE TO STOP	3	5	STANDING	2	6
25	BOX	6	10	STANDING	2	12
25-15	FAILURE TO STOP/MOVING	3	15	STANDING	1	3
<b>NIGHT</b>						
100	CONTROLLED PAIR (BARRICADES)	2	8	STAND, KNEE	4	8
100	MOVERS (BARRICADES)	2	8	STAND, KNEE	4	8
25	HEAD SHOT	1	3	STANDING	3	3
25	FAILURE TO STOP	3	5	STANDING	2	6
25	BOX	6	10	STANDING	2	12
25-15	FAILURE TO STOP/MOVING	3	15	STANDING	1	3
					<b>TOTAL DAY 2/3=</b>	<b>160</b>



# Scoring Conversion – ARQ to ART



Targets Destroyed	Table1	Table 2	Total Score	Category	% of Targets
0	0	0	0	UNQ	0%
1	28	13	41	UNQ	2%
2	35	15	50	UNQ	4%
3	42	17	59	UNQ	6%
4	49	19	68	UNQ	8%
5	56	21	77	UNQ	10%
6	63	23	86	UNQ	12%
7	70	25	95	UNQ	14%
8	77	27	104	UNQ	16%
9	84	29	113	UNQ	18%
10	91	31	122	UNQ	20%
11	98	33	131	UNQ	22%
12	105	35	140	UNQ	24%
13	112	37	149	UNQ	26%
14	119	39	158	UNQ	28%
15	126	41	167	UNQ	30%
16	133	43	176	UNQ	32%
17	140	45	185	UNQ	34%
18	147	47	194	UNQ	36%
19	154	49	203	UNQ	38%
20	161	51	212	UNQ	40%
21	168	53	221	UNQ	42%
22	175	55	230	UNQ	44%
23	182	57	239	UNQ	46%
24	189	59	248	UNQ	48%
25	190	60	250	MM	50%
26	190	62	252	MM	52%
27	193	62	255	MM	54%
28	195	63	258	MM	56%
29	197	64	261	MM	58%
30	199	65	264	MM	60%
31	202	65	267	MM	62%
32	205	65	270	MM	64%
33	208	66	274	MM	66%
34	211	67	278	MM	68%
35	213	67	280	SS	70%
36	216	68	284	SS	72%
37	219	69	288	SS	74%
38	222	70	292	SS	76%
39	225	71	296	SS	78%
40	228	72	300	SS	80%
41	231	73	304	SS	82%
42	231	74	305	EX	84%
43	233	76	309	EX	86%
44	235	78	313	EX	88%
45	237	80	317	EX	90%
46	239	83	322	EX	92%
47	241	87	328	EX	94%
48	244	91	335	EX	96%
49	247	95	342	EX	98%
50	250	100	350	EX	100%

Box/FTS/FTS-M	Category	% of Drills
0	UNQ	0%
1	QUAL	10%
2	QUAL	20%
3	QUAL	30%
4	QUAL	40%
5	QUAL	50%
6	QUAL	60%
7	QUAL	70%
8	QUAL	80%
9	QUAL	90%
10	QUAL	100%

## Close up of what Qualifies a shooter (25 – 50 D)

Box/FTS/FTS-M	Category	% of Drills
0	UNQ	0%
1	QUAL	10%
2	QUAL	20%
3	QUAL	30%
4	QUAL	40%
5	QUAL	50%
6	QUAL	60%
7	QUAL	70%
8	QUAL	80%
9	QUAL	90%
10	QUAL	100%

25	190	60	250	MM	50%
26	190	62	252	MM	52%
27	193	62	255	MM	54%
28	195	63	258	MM	56%
29	197	64	261	MM	58%
30	199	65	264	MM	60%
31	202	65	267	MM	62%
32	205	65	270	MM	64%
33	208	66	274	MM	66%
34	211	67	278	MM	68%
35	213	67	280	SS	70%
36	216	68	284	SS	72%
37	219	69	288	SS	74%
38	222	70	292	SS	76%
39	225	71	296	SS	78%
40	228	72	300	SS	80%
41	231	73	304	SS	82%
42	231	74	305	EX	84%
43	233	76	309	EX	86%
44	235	78	313	EX	88%
45	237	80	317	EX	90%
46	239	83	322	EX	92%
47	241	87	328	EX	94%
48	244	91	335	EX	96%
49	247	95	342	EX	98%
50	250	100	350	EX	100%



# ARQ Phase II Testing Results



- 8 iterations of ARQ testing captured 679 data points (individual shooters scores), **636 useable data points.**
- Only 600 data points were required.
- Data collected to date:
  - 72 Shooters from Yorktown (Nov 2019)
  - **43 Shooters from Yorktown (Dec 2019)**
  - 30 Shooters from MCAGCC (May 2020)
  - 127 Shooters from MCAGCC (June 2020)
  - 181 Shooters From MCAGCC (July 2020)
  - 21 Shooters from Edson Range (Aug 2020)
  - 87 Shooters from Stone Bay (Aug 2020)
  - 118 Shooters from Stone Bay (Sept 2020)
- The ranks range from Pvt, to Capt, weapons used include the M16, M4, and M27.



# ARQ Phase II Testing Results

- Out of 636 shooters 31% - UNQ, 38% qualified MM, 21% qualified SS, and 9% qualified expert.
- Most difficult drill for shooters to pass is the day failure-to-stop while moving from the 25-15yd line drill.
- Most difficult stage to get destroys on is the 500 Sustained fire.
- Easiest stage for shooters to pass is the day movers at the 100.

QUALIFIED		
CLASS	SHOOTERS	PERCENT
Ex	58	9%
SS	135	21%
MM	243	38%
TOTAL	Qualified	436 / 69%

UNQUALIFIED		
STAGE	SHOOTERS	PERCENT
Drills	14	2%
Destroys	173	27%
Drills & Destroy	13	2%
TOTAL	Unqualified	200 / 31%



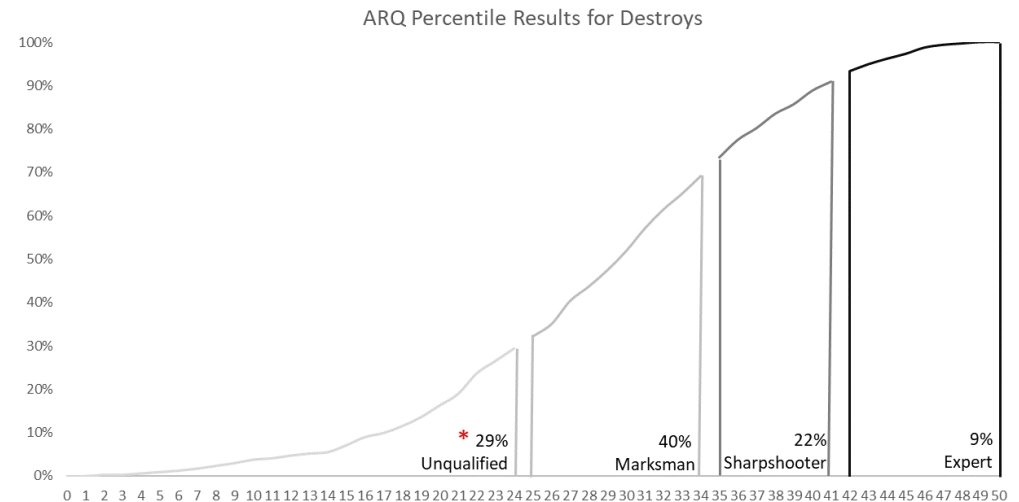
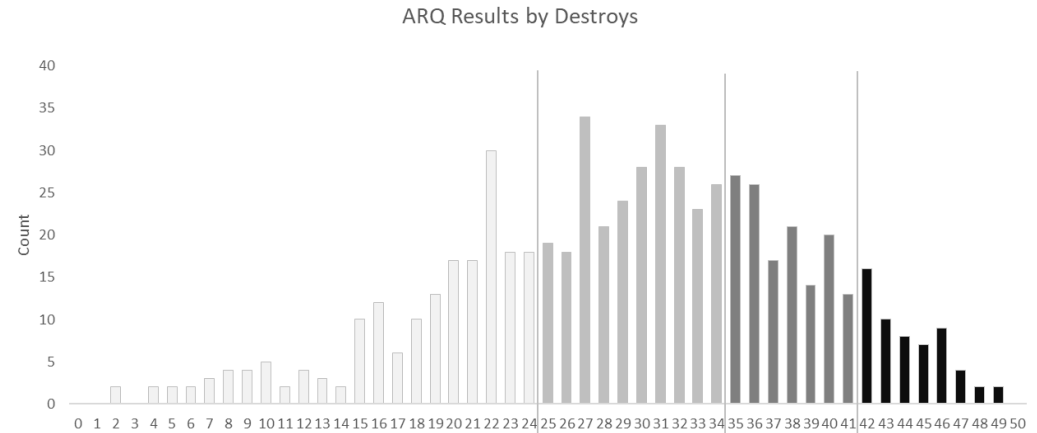
# Destroy Completion



Are the current thresholds acceptable, or should they be adjusted?

- What capabilities must a shooter demonstrate to qualify as MM, SS, or EX? (long range, short range, stationary targets, moving targets)
- What proportion of the population represents that view?

Destroy stage		
POTENTIAL CLASS	SHOOTERS	PERCENT
Ex	58	9%
SS	138	22%
MM	254	40%
TOTAL	Pass	450 / 71%
	Fail	186 / 29% *



\* NOTE: 2% includes Marines who failed **both** Destroy & Drill stages





# Drill Completion



Passing Drill stage		
POTENTIAL STATUS	SHOOTERS	PERCENT
Pass	609	96%
Fail	27	4% *

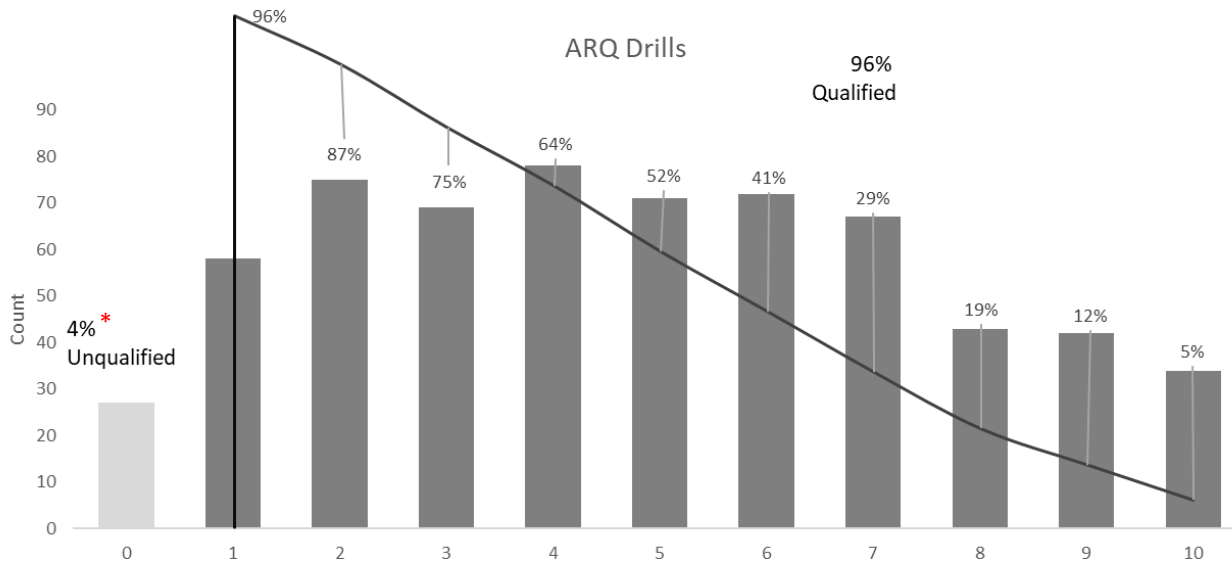
Example interpretation:

A shooter can successfully complete from anywhere from 0 to 10 drills total. Each vertical bar indicates the count of successful drills out of the 636 shooters. The number increments of successful drills are noted at the bottom of the chart.

The percentage values indicate the cumulative percent of shooters out of 636 that completed one or more drills. Out of 636 shooters:

- 96% completed one (1) or more drills
- 87% completed two (2) or more drills
- ↓
- 5% completed all ten (10) drills

There were 4% of shooters who failed to complete even one drill and as a result were deemed unqualified (UNQ) on the ARQ.

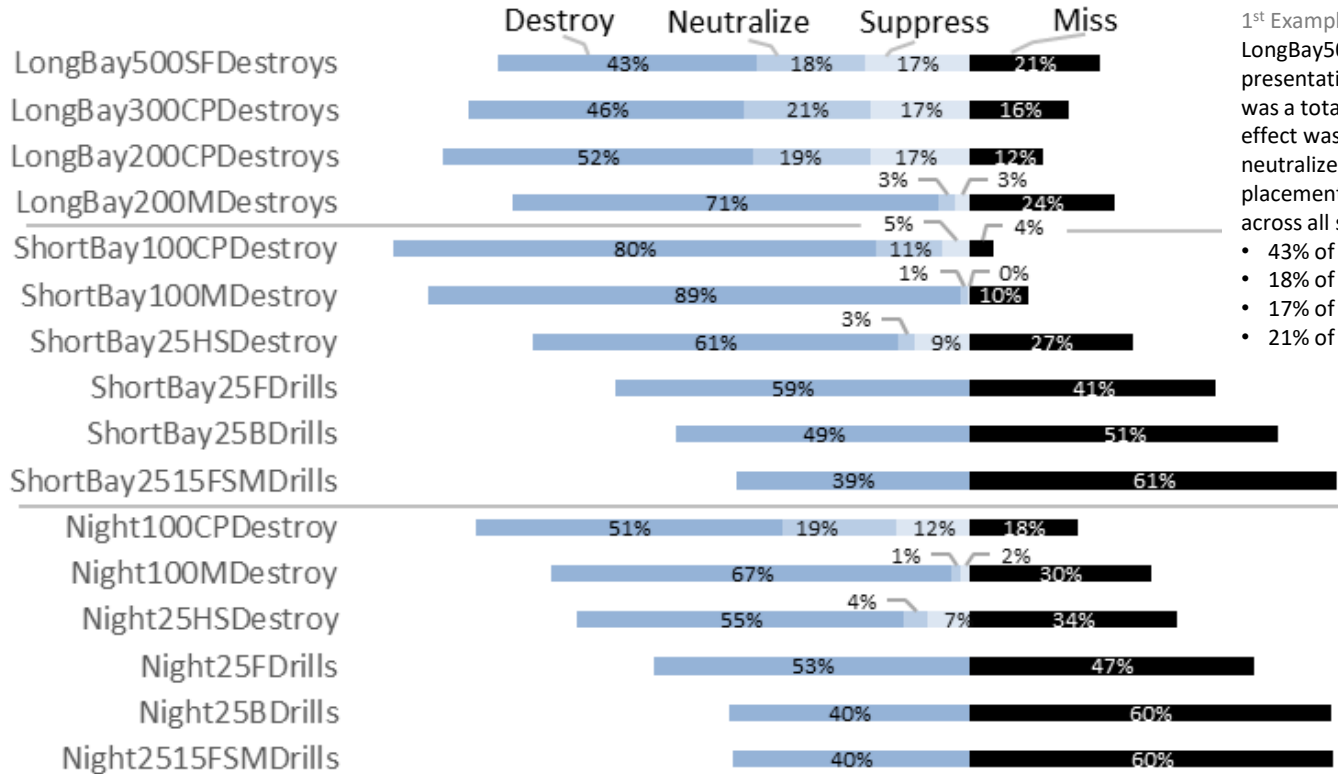


\* NOTE: 2% includes Marines who failed **both** Destroy & Drills stages





# Total Phase II iterations (target presentations) hit percentage by engagement



1<sup>st</sup> Example interpretation:

LongBay500SFDestroys – each iteration is a single target presentation for a given shooter. For 636 shooters there was a total of 5,080 valid iterations where the maximum effect was recorded as either target destroyed, neutralized, suppressed or missed based on round placement. Here is the breakout of the 5,080 iterations across all shooters by percentages:

- 43% of iterations were destroys
- 18% of iterations were neutralize
- 17% of iterations were suppress
- 21% of iterations were miss

2<sup>nd</sup> Example interpretation:

Night25BDrills – Each iteration is a two-target presentation to a single shooter at a 25 yard distance. There are 2 iterations per shooter. For 636 shooters there was a total of 1,272 valid iterations. A drill is considered successful if there are two shots in the destroy chest region and one in the head destroy region of **both** targets. Here is the breakout of the 1,272 iterations by percentages:

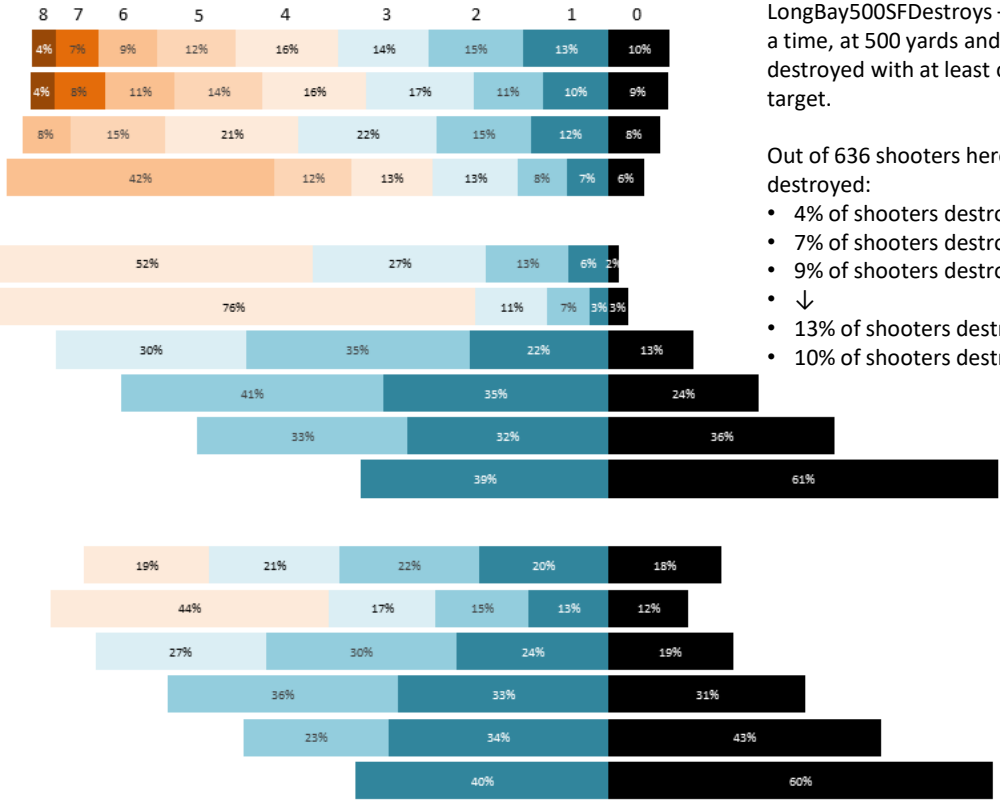
- 40% of drills were successful
- 60% of drills were unsuccessful



# Number of iterations 'passed' by percentage of shooters



LongBay500SFDestroys  
 LongBay300CPDestroys  
 LongBay200CPDestroys  
 LongBay200MDestroys  
  
 ShortBay100CPDestroy  
 ShortBay100MDestroy  
 ShortBay25HSDestroy  
 ShortBay25FDrills  
 ShortBay25BDrills  
 ShortBay2515FSMDrills  
  
 Night100CPDestroy  
 Night100MDestroy  
 Night25HSDestroy  
 Night25FDrills  
 Night25BDrills  
 Night2515FSMDrills



1<sup>st</sup> Example interpretation:

LongBay500SFDestroys – Each shooter is presented with 8 targets, one at a time, at 500 yards and 5 rounds per target. A target is considered destroyed with at least one or more rounds in a destroy region of the target.

Out of 636 shooters here is their breakout by percentage of targets they destroyed:

- 4% of shooters destroyed 8 of 8 targets
- 7% of shooters destroyed 7 of 8 targets
- 9% of shooters destroyed 6 of 8 targets
- ↓
- 13% of shooters destroyed 1 of 8 targets
- 10% of shooters destroyed 0 of 8 targets.

2<sup>nd</sup> Example interpretation:

Night25BDrills – Each shooter is presented with 2 drills, each with 2 side-by-side targets per drill at 25 yards and 6 rounds per drill. A drill is considered successful if there are two shots in the destroy chest region and one in the head destroy region of both targets.

Out of 636 shooters here is their breakout by percentage of drills they completed successfully:

- 23% of shooters completed 2 of 2 drills
- 34% of shooters completed 1 of 2 drills
- 43% of shooters 0 of 2 drills

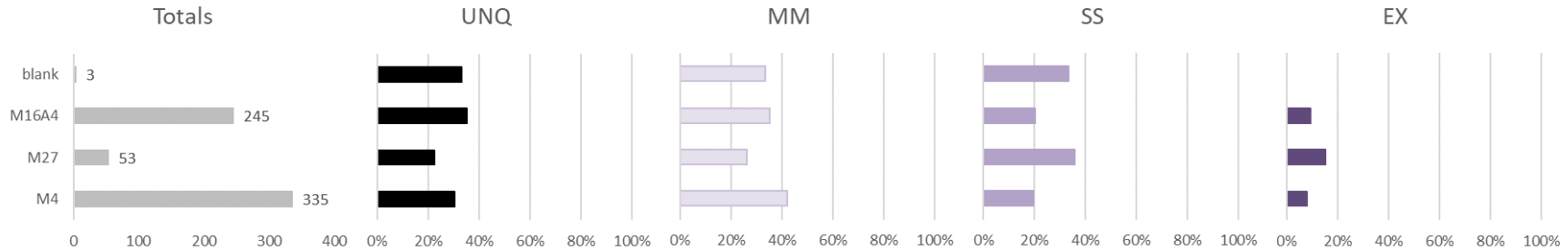
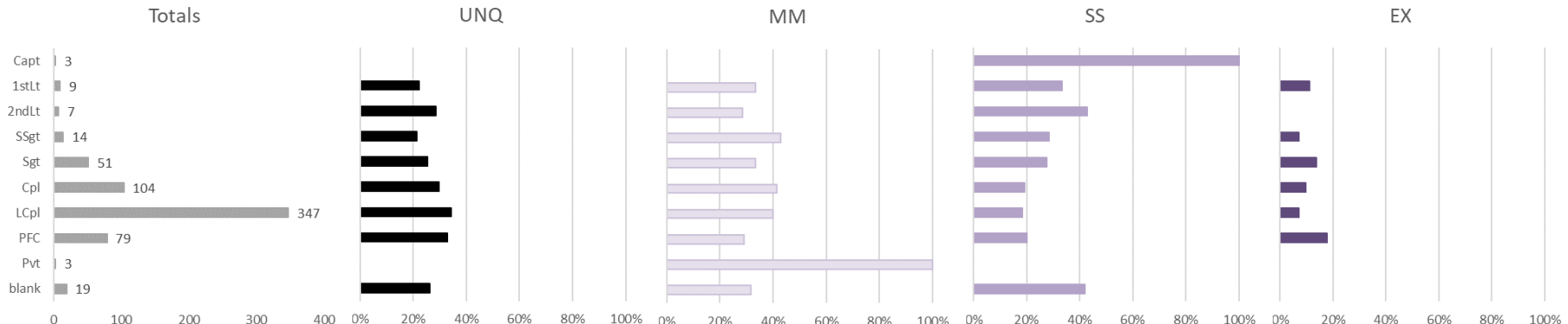


# Percentage by Unit and Qualification Level





# Qual Class Percentage by Rank and Weapon





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# ARQ compared to ART Table 5/6



# ARQ compared to ART Table 5/6



## ARQ DAY 2/3 QUALIFICATION

RANGE	DRILL	ROUNDS PER ITERATION	TIME (sec)	POSITION(S)	ITERATION	TOTAL ROUNDS
<b>LONG BAY</b>						
500	SUSTAINED FIRE	5	45	PRONE	8	40
300	CONTROLLED PAIR	2	15	STAND, KNEE OR PRONE	8	16
200	CONTROLLED PAIR (BARRICADES)	2	10	STAND, KNEE	6	12
200	MOVERS (BARRICADES)	2	8	STAND, KNEE	6	12
<b>SHORT BAY</b>						
100	CONTROLLED PAIR (BARRICADES)	2	8	STAND, KNEE	4	8
100	MOVERS (BARRICADES)	2	8	STAND, KNEE	4	8
25	HEAD SHOT	1	3	STANDING	3	3
25	FAILURE TO STOP	3	5	STANDING	2	6
25	BOX	6	10	STANDING	2	12
25-15	FAILURE TO STOP/MOVING	3	15	STANDING	1	3
<b>NIGHT</b>						
100	CONTROLLED PAIR (BARRICADES)	2	8	STAND, KNEE	4	8
100	MOVERS (BARRICADES)	2	8	STAND, KNEE	4	8
25	HEAD SHOT	1	3	STANDING	3	3
25	FAILURE TO STOP	3	5	STANDING	2	6
25	BOX	6	10	STANDING	2	12
25-15	FAILURE TO STOP/MOVING	3	15	STANDING	1	3
<b>TOTAL DAY 2/3=</b>						<b>160</b>

## TABLE 5 SHORT RANGE DAY (PRE-EVALUATION AND EVALUATION)

STAGE	METER LINE	DRILL	ROUNDS PER ITERATION	EXPOSURE TIME	POSITION(S)	ITERATION(S)	TOTAL ROUNDS
STAGE 1	25	CONTROLLED PAIR	2	5 SEC	STANDING	2	4
		BOX DRILL	6	5 SEC	STANDING	1	6
		FAILURE TO STOP PELVIC	3	5 SEC	STANDING	1	3
	25-15	BOX DRILL	6	N/A	FWD MOVEMENT	1	6
STAGE 2	15	HAMMER PAIR	2	5 SEC	STANDING	2	4
		BOX DRILL	6	5 SEC	STANDING	1	6
		FAILURE TO STOP PELVIC	3	5 SEC	STANDING	1	3
	15-10	FAILURE TO STOP	3	N/A	FWD MOVEMENT	1	3
STAGE 3	10	HAMMER PAIR	2	5 SEC	STANDING	2	4
		HEAD SHOT	1	5 SEC	STANDING	1	1
		BOX DRILL	6	5 SEC	STANDING	1	6
		FAILURE TO STOP HEAD	3	5 SEC	STANDING	1	3
		FAILURE TO STOP HEAD	3	N/A	FWD MOVEMENT	1	3
		HAMMER PAIR	2	5 SEC	STANDING	2	4
STAGE 4	5	HEAD SHOT	1	5 SEC	STANDING	1	1
		FAILURE TO STOP HEAD	3	5 SEC	STANDING	1	3
		<b>TOTAL</b>					

	Total Rounds	Iterations
ARQ	48	16
Table 5/6	60	20





# ARQ vs Tables 3-6



## Discussion

1. ARQ vs Tables 3/4 and 5/6 (How does ARQ meet these tables?).
2. ARQ does not meet the UKD portions of tables 3 and 4. however it does meet the supported positions of tables 3 and 4
3. Entry level, SOI and TBS continue to fire tables 3-6?

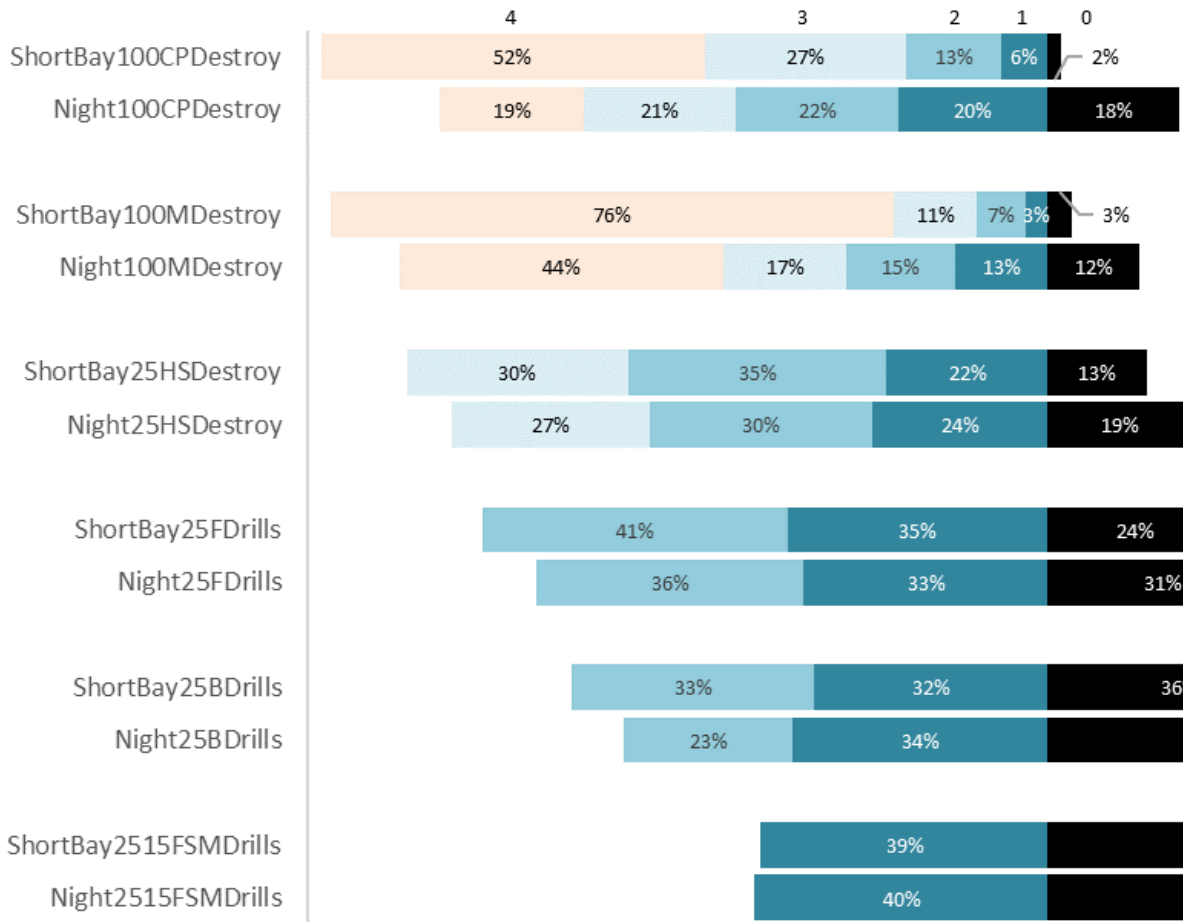
## Recommendation



# Night Engagements



# Comparing Day vs. Night engagements



Number of iterations 'passed' by percentage of shooters



# Current ARQ vs ARQ w/o Night



Current	Iterations	Rds/Iter	Rounds/COF		No Night	Iterations	Rds/Iter	Rounds/COF
LongBay500SFDestroys	8	5	40		LongBay500SFDestroys	8	5	40
LongBay300CPDestroys	8	2	16		LongBay300CPDestroys	8	2	16
LongBay200CPDestroys	6	2	12		LongBay200CPDestroys	7	2	14
LongBay200MDestroys	6	2	12		LongBay200MDestroys	7	2	14
ShortBay100CPDestroy	4	2	8		ShortBay100CPDestroy	7	2	14
ShortBay100MDestroy	4	2	8		ShortBay100MDestroy	7	2	14
ShortBay25HSDestroy	3	1	3		ShortBay25HSDestroy	6	1	6
ShortBay25FDrills	2	3	6		ShortBay25FDrills	4	3	12
ShortBay25BDrills	2	6	12		ShortBay25BDrills	4	6	24
ShortBay2515FSMDrills	1	3	3		ShortBay2515FSMDrills	2	3	6
Night100CPDestroy	4	2	8					
Night100MDestroy	4	2	8					
Night25HSDestroy	3	1	3					
Night25FDrills	2	3	6					
Night25BDrills	2	6	12					
Night2515FSMDrills	1	3	3					
	Iterations		Total Rounds			Iterations		Total Rounds
Destroys	50		118		Destroys	50		118
Drills	10		42		Drills	10		42
			160					160
	Iterations	Percentage				Iterations	Percentage	
Long	28	56%			Long	30	60%	
Short	22	44%			Short	20	40%	

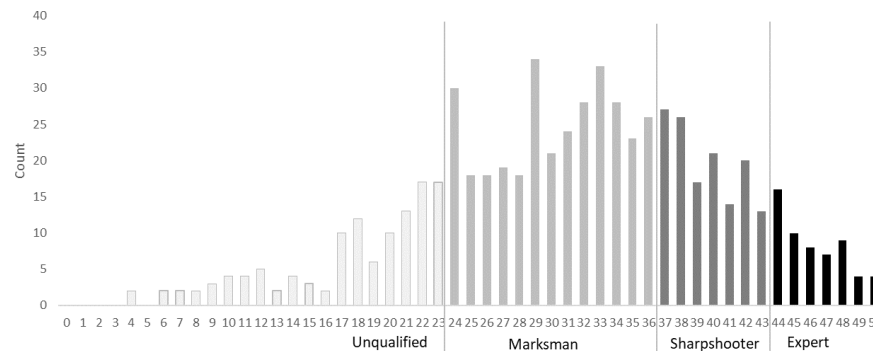


# Destroying Targets - No Night

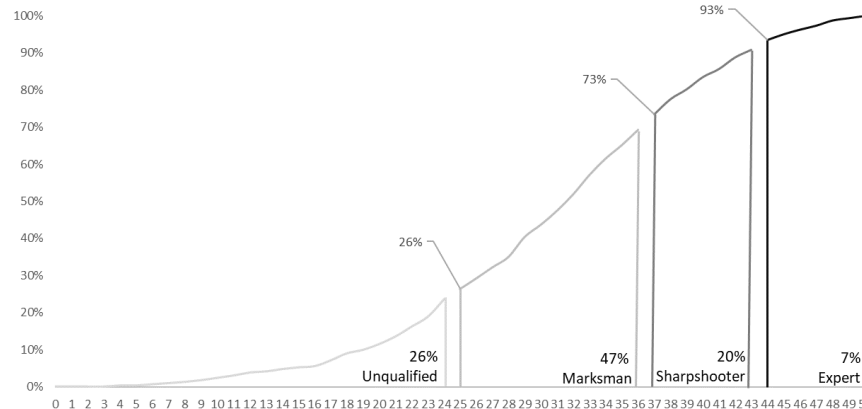


- Average number of targets destroyed increased from 29.4 to 31.3 based on elimination and conversion of Night to Day only.
- UNQ threshold left at 24 or less targets destroyed.
- Marksman range increased from 25-34 to 25 – 36 targets destroyed
- Sharpshooter ranged increased from 35-41 to 37-43 targets destroyed
- Expert range increased from 42 or more to 44 or more targets destroyed

No-Night Scenario - ARQ Results by Destroys



No-Night Scenario - ARQ Percentile Results for Destroys





# ARQ Night Engagements



## Discussion

1. How does the Night Engagement stage affect the Marines overall score?
2. Does night qualification need to be a unit responsibility?
3. How do we get NVG's and PEQ's in every Marines hands for qual?
4. What is going to be the night marking solution?

## Recommendation



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# Target/barricade availability



# Target Prices

## USMC Threat Long Bay Target with Visible Zones 24" X 45"



Quantity	Price	Price per target
100	\$ 35.00	\$ .35
250	\$ 85.00	\$ .34
500	\$ 153.00	\$ .306
1000	\$ 290.00	\$ .29
10,000+	\$ 2,708.00	\$ .2708

- **QUALIFICATION TARGETS INC**
- Lowest order number is 100
- 50 Target order increments
- Does not include shipping
- 100k targets of one type (long or short bay) will take 2-3 weeks, 100k of both types would double production time.

## USMC Threat Short Bay Die-Cut Target Visible Zones 19.5" X 39.5"

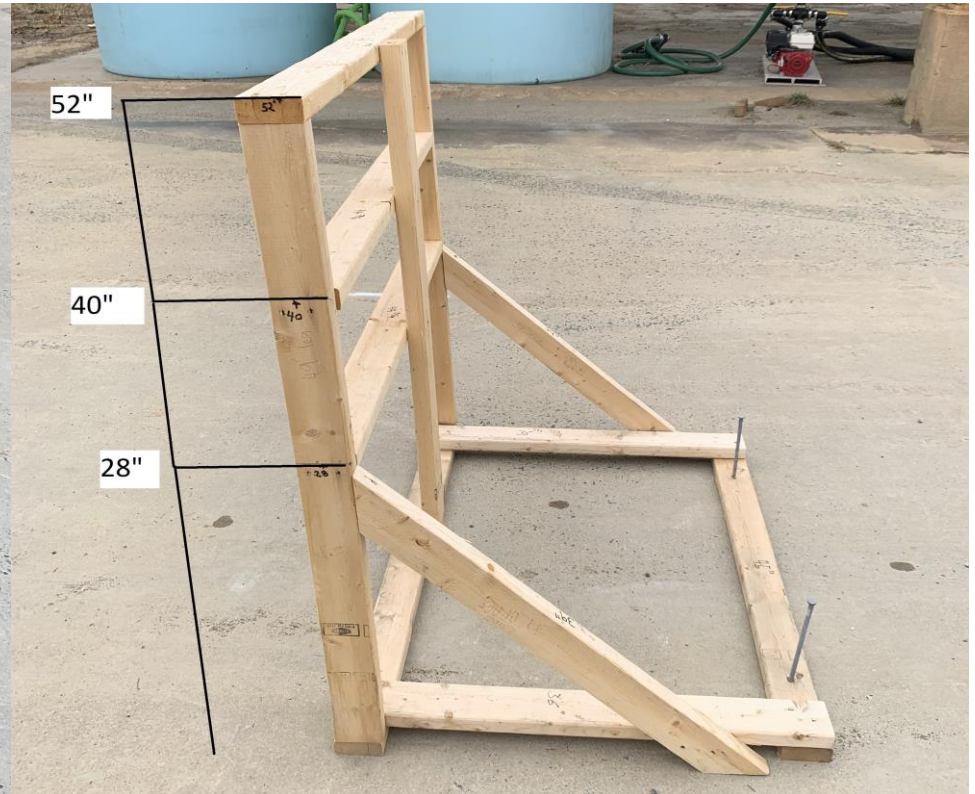
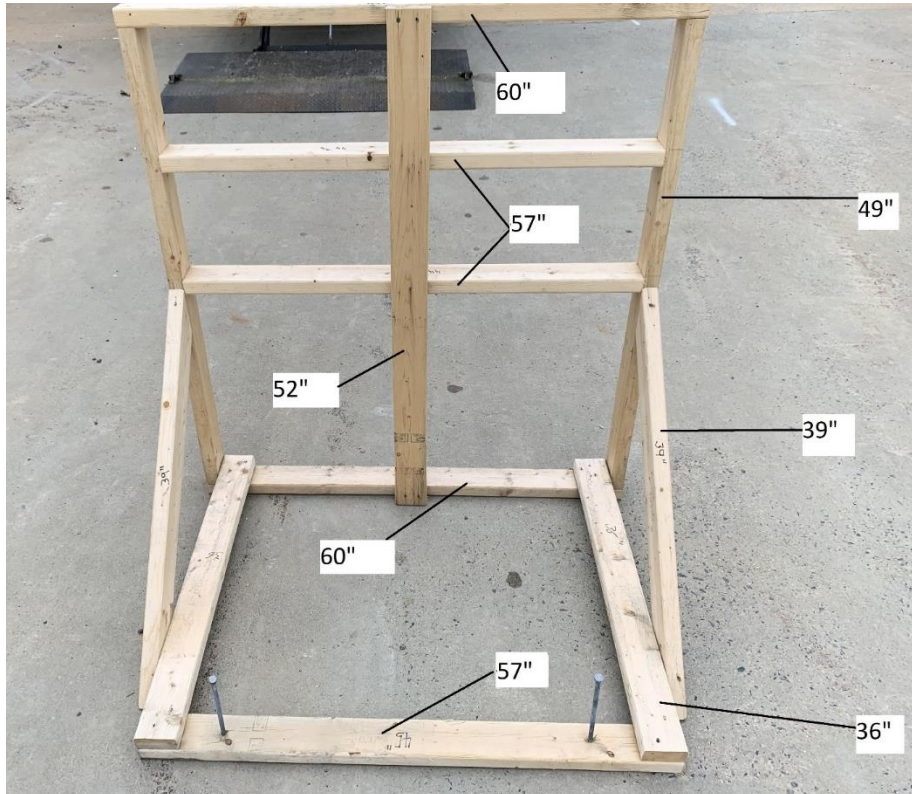


Quantity	Price	Price per target
100	\$ 34.25	\$ .3425
250	\$ 85.50	\$ .342
500	\$ 165.50	\$ .331
1000	\$ 320.00	\$ .32
10,000+	\$ 2,989.00	\$ .2989



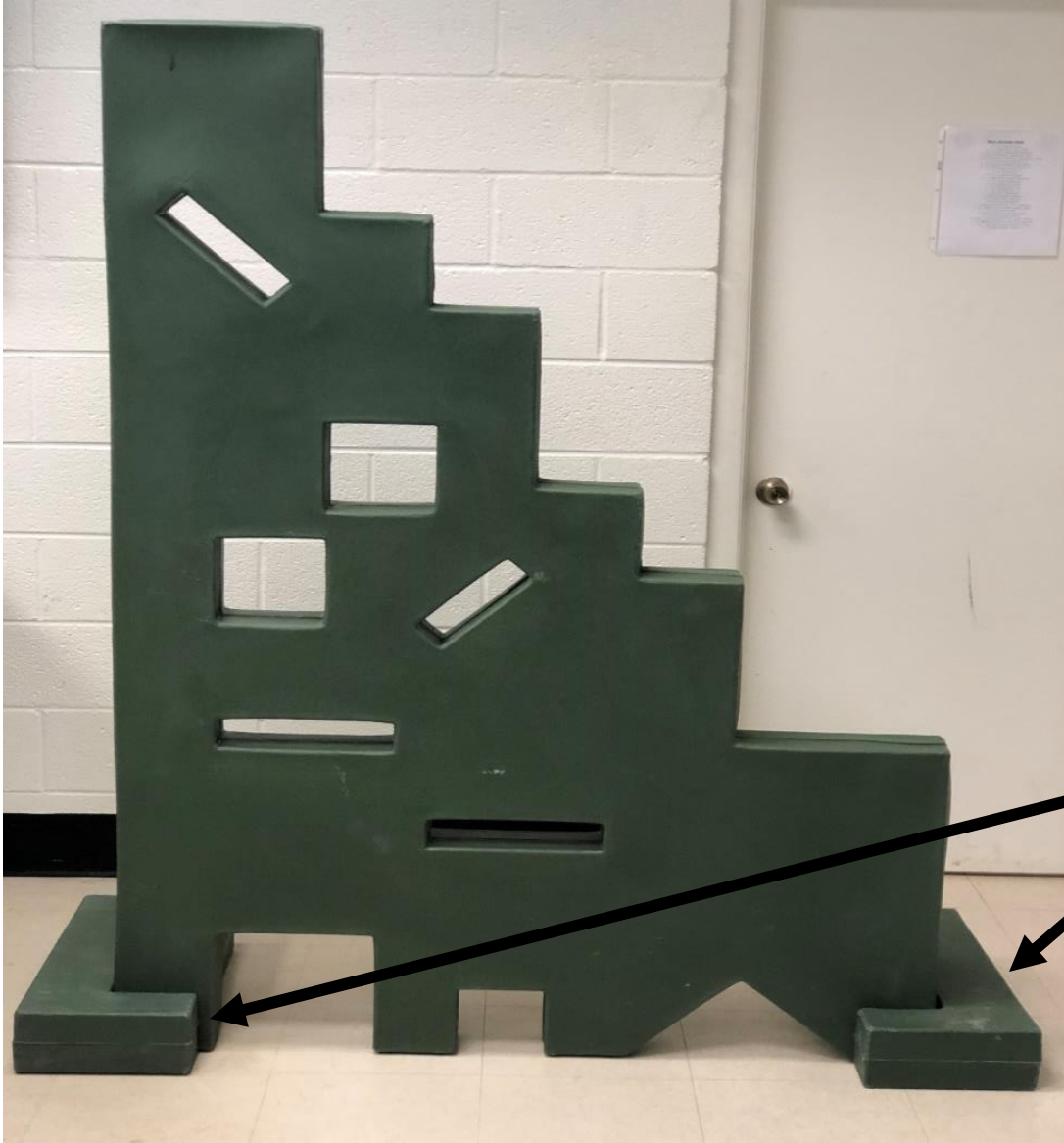


# ARQ Barricades





# ARQ Barricades



Can be utilized for left or right handed shooters. The barricade offers a variety of ways to shoot from. The legs can be filled with water, sand, or concrete.



# Cost Analysis



Materials		Material Cost	Ammo	Ammo Cost	Total Cost (200) shooters
Current ART	Able x 100 @ \$1.71 ea	\$4,384.50	466 rds of A059 @ \$0.35/rd	\$163.10/ Shooter	\$37,004.50
	Dog x 100 @ \$4.06 ea				
	B-Mod x 100 @ \$2.24 ea				
	Table 2 Threats x 600 @ \$0.45 ea				
	Hard Cards x 150 @ \$1.79 ea				
	Chlorplast x 150 @ \$19.20 ea				
	3 in Shot Spotter x 250 @ \$.07 ea				
	5 in Shot Spotter x 250 @ \$0.12ea				
	10 inch Shot Spotter x 250 @ \$0.19 ea				
	Spindle x 250 @ \$0.28ea				
ARQ	Long Bay x 300 @ \$ 0.34 ea	\$3,665.9 / \$2,389.5	460 rds of A059 @ \$0.35/rd	\$161.00/ Shooter	\$35,865.9 / \$38,255.4
	Short Bay x 900 @ \$ 0.331 ea				
	Hard Cards x 150 @ \$1.79 ea				
	Chlorplast x 150 @ \$19.20 ea				
	3 in Shot Spotter x 250 @ \$.07 ea				
	5 in Shot Spotter x 250 @ \$0.12ea				
	Spindle x 250 @ \$0.28ea				
	Wooden Barricade x 50 @ \$47.79ea				



# Target/barricade Availability



## Discussion

1. NSN Timeline
2. Possibility of printing on a white sheet to help with ID of impacts
3. Scoring, do we still want the long bay target if we are not using the white suppress
4. Do we want to collect all N,S,M if we are only grading the D's.
  - If we collect all this data who will it benefit
5. From Qualification Tgts:
  - For a total of 100,000 targets it would take us about 2-3 weeks to be ready to ship.

## Recommendation



# ARQ Site Specific Issues



## Discussion

- 100/200 yd Moving Threat Engagement

## Recommendation



# ARQ Equipment Issues



## Discussion

1. Night optics
  - FMTCs/Shooters
  - Armory space
2. Target/supporting equipment
3. PPE/lights
  - FMTCs

## Recommendation





# ARQ Implementation Plan



## Discussion

1. WRT facilities (When facilities are updated?)
2. WRT equipment (Units who have equipment only/once MTU receives)
3. Scoring (MCTIMS update)
4. Information available for units to conduct preparatory training
5. Promotion effects
6. Remediation
7. Waivers & Exemptions
8. Available prep training
9. Range safety
  - Marking plan
  - Range Policy modifications

## Recommendation



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# Questions