PHILIPPINE NAVY
PHILIPPINE FLEET
HEADQUARTERS NAVAL SPECIAL OPERATIONS GROUP
Naval Base HeracleoAlano
Sangley Point, Cavite City

10 April 2012

From: Commander, Naval Special Operations Group
To: Commander, Philippine Fleet
(Attention: AC of FS for Logistics, F4)

Subj: Report on UDMC Pneumatic Valve and Rod (PVAR) 5.56mm assault Rifle

Encl: Detailed evaluation report of the above subject

BACKGROUND:

1. The Naval Special Operations Group was tasked to conduct evaluation of the Pneumatic Valve and Rod (PVAR) Gas Piston 5.56mm Rifle designed and manufactured by the United Defense Manufacturing Corporation (UDMC).

2. In January of 2010, UDMC was commissioned by then VADM Ferdinand S Golez AFP and later pursued by RADM Danilo M Cortez to develop a derivative of the old M16 assault rifle that can withstand the rigors of fighting environment of Naval Special Operations Group (NAVSOG). Said design must address the inherent functionality problems encountered with a standard M16 rifle such as heat and carbon build-up in the bolt head and bolt carrier assemblies which causes jams and stoppages aside from safety issues involved when water, after being submerged at sea, is not drained from the rifle before commencing fire.

DISCUSSION:

3. The first set of prototypes were initially tested and evaluated by NAVSOG last April 2010 at Sangley Point. With the data gathered from the tests, the second set of prototype of five (5) new PVAR rifle with 14.5" barrel were forwarded to Naval Special Operations Unit Six (NAVSOU 6) on August 2010 for field testing. Results of that field testing in Western Mindanao enabled NAVSOG and UDMC to undertake the necessary corrections and adjustments. In November 2011, as part of the Co-Research and Development of NAVSOG and UDMC, the team came up with five (5) newly-designed PVAR assault rifle with the following specifications:

Parts	Specifications
Barrel	Three (3) 14.5" Daniel Defense barrels 1:7 One (1) 11.5" Daniel Defense barrel 1:7 One (1) 10.5" Daniel Defense barrel 1:7
Bolt Carrier Assembly	One-piece UDMC bolt carrier with solid gas key Standard Colt bolt

Buttstock	Six (6) position collapsible buttstock
Lower Receiver	Government issue lower receiver
Handguard	One-piece quadrail with 1913 picatinny rail
Operating System	External piston system

4. When the joint R&D team concluded that the best design, the best materials and the correct engineering processes were already achieved, I ordered the full testing and evaluation of the rifles. Randomly selected were NAVSOG personnel who were tasked to fire the rifles without revealing to them the revolutionary design of the PVAR. Consolidated total rounds fired from the various venues were more than 7,000 rounds for each rifle. Once again, different types of manufacturers and grains (55 and 62) of the 5.56mm X 45mm NATO ammunition were used such as the M193 and SS-109 (M855) from LCC, TZZ, DND Arsenal and Armscor. Training ammunitions and reloads which has light powder loads were also used and mixed together with the combat loads to determine the self-regulating features of the PVAR. Endurance firing and torture tests during the period Jan to Mar 2012 were performed in the following venues:

a. NAVSOG firing range using NAVSOG ammunition in the armory plus the LCC ammunition provided by the US SEALs during the Flash Piston 12-1 exercise.

b. DND Government Arsenal in Bataan during the Tactical Diving Course Class 03 marksmanship training.

c. Crow Valley range, Sangley coastlines and Caballo Island for field torture testing of the PVAR to mimic the desert (sandy), adverse condition at sea (water) and jungle or tropical condition (mud).

d. UDMC underground firing range.

5. The following are the results:

a. Non-discrimination in ammunition. PVAR was able to fire all types of 5.56mm ammunition regardless of projectile weight (55/62 grains) and regardless of brand. Even the reload ammunition was able to cycle with noted differences in cyclic rates without any adjustments in the rifle.

b. Minimal muzzle flash. Rifles were fired at night and notable reduction in flash signature was observed.

c. Reduced recoil. The rifles tested have a shortened phantom flash hider and not a muzzle break or compensator yet still exhibits reduced recoil allowing firers more control and faster target acquisition.

d. Other results may be seen on the attached detailed evaluation report on page 6 to 8.

RECOMMENDATIONS:

6. After 28 months of research and development of the PVAR assault rifle, from January 2010 to the present, testing and evaluating as well as researching on failed and successful technologies, continuous process engineering the production of parts of the rifle including the best metallurgy, NAVSOG now recommends the following:

a. Refurbishing and upgrading to PVAR system all unserviceable and old M16 rifles in NAVSOG inventory. The PVAR upper assemblies from UDMC are 100% compatible with the Government Issue Colt/Elisco lower assemblies as proven by the tests. Hence, UDMC only needs to replace the upper receiver and the butt stock with 6 position adjustable butt stock while NAVSOG retains the lower receiver. Based on present inventory there are [redacted] units broken down as follows: [redacted] *serviceable;* [redacted] *unserviceable; and* [redacted] *baby – unserviceable.*

b. That the refurbished and upgraded rifles must adhere to the specifications on the attached detailed evaluation under Circular of Reference (COR) for both general and weapons specification at page 10 - 14.

c. If this paper merits your approval, NAVSOG further recommends endorsement to higher headquarters to directly talk with UDMC regarding details of and cost/price of the PVAR since NAVSOG have not talk to UDMC regarding cost/price per unit refurbished.

7. For your information, reference and favourable consideration on the above recommendations under para 6a-c.

[redacted]

CAPT PN(GSC)

Copy Furnished:

a. Assistant Chief of Naval Staff for Logistics, N4
b. United Defense Manufacturing Corporation

Detailed Evaluation Report on UDMC's PVAR Assault Rifle

I. Background

In January of 2010, United Defense Manufacturing Corporation (UDMC) was commissioned by then Flag Officer in Command, Philippine Navy VADM Ferdinand S Golez AFP and later furthered pursued by his successor, RADM Danilo M Cortez AFP, to develop a prototype of a gas-piston design of the standard issue M16 rifle, taking into consideration the following problems being encountered with the M16 rifle's "Direct Gas Impingement System" or the so-called "gas tube design". As intended, the aim of the project was further narrowed down to developing an assault rifle for the Navy's Special Operations Group (NAVSOG) (**TAB A**).

Before the Research and Development commenced, UDMC through NAVSOG inputs had to take into consideration the conditions desired by NAVSOG to be able to identify the changes needed on the original design of the M16. The result is to develop an assault rifle that could be used reliably and accurately despite the adverse conditions at sea (water) in the tropical environment (jungles/mud) and desert (sand) conditions. The following issues stated below were some of the problems of the conventional direct gas impingement system M16A1, M16A2 and M4 that needed to be addressed in the new design of the NAVSOG standard assault rifle:

1. Extreme heat, carbon deposits and reliability issues

During firing of a round, high-pressure hot gases are rammed back through a gas tube to the bolt assembly and bolt carrier group in order to complete the rifle's operating cycle. This rearward movement however, also causes the accumulation of extreme heat, unburned powder and carbon into the bolt and bolt carrier group. Through prolonged use, the unburned powder and carbon accumulation causes malfunction, maintenance problems and hasten wear and tear.

The problem is compounded since the "gas tube" system was originally developed for the long 20-inch barrels with a rifling twist of one complete turn in 12 inches (1X12 rifling twist). Today, barrels are shortened drastically for easier transport, lighter load, and maneuverability as preferred by special operations forces. Unfortunately, a shorter barrel translates to smaller mass and therefore more heat concentration in a smaller metal area. And this heat is then communicated to the bolt and bolt carrier group.

2. Excessive Recoil, muzzle rise and accuracy issues

Excessive recoil and muzzle rise are due mainly to the conventional high-powered rifle's design itself whereby the hot compressed gases are rammed back into the bolt contributing to the recoil and muzzle rise. This results to cycling and reliability problems and firing accuracy issues. The rifle has a high tendency to jam and the soldier (especially the small to medium-framed personnel) will have trouble controlling his aim when the rifle is fired on bursts or full automatic mode.

Reacquiring the target is also rendered more difficult even on semi-automatic since the tendency is for the muzzle to rise and kick to the 1 or 2 o'clock position.

As a consequence of preference to shorter barrel rifles as mentioned in problem 1, a shorter barrel means less distance for the projectile to turn in order for the ammunition powder to burn completely before the projectile leaves the barrel. Solving this problem by a faster rifling twist and using a heavier projectile unfortunately results to more recoil and muzzle rise. A 55-grain (M193) projectile in a 20 inch "1x12" rifling twist barrel will have much less recoil and muzzle rise than an SS-109, 62-grain (M855) projectile in a 14.5 inch "1x7" rifling twist barrel.

3. Not suitable for use in adverse battle conditions

The conventional M16 and M4 needs to be improved to suit the fighting doctrine and environment from where the SEALs operate. Refer to the "After-Encounter Report" in para VII. Justifications/Reasons at page 9.

II. UDMC started the development of the First generation PVAR assault rifle

With the above details at the hands of UDMC, they commenced the R&D and started working on the project. The result of the UDMC's work is the **proprietary patented Pneumatic Valve and Rod (PVAR) System**. UDMC submitted three (3) units of PVAR rifles, Two (2) 16-inch barrel unit and One (1) 7.5-inch barrel to the Assistant Chief of Naval Staff for Logistics, N4 were said office task the Naval Special Operations Group (NAVSOG) to conduct a test and evaluation in April 2010. The rifle submitted by UDMC was known to be the **first generation PVAR**. Test and evaluation started immediately with all units alternatively fired in semi automatic mode and in full automatic mode. This was done during the time of CDR [redacted] PN as NAVSOG Commander where he submitted a report (**Tab B**) with the following findings:

Strength of PVAR:

1. PVAR exceeded standards for safety tests particularly the "Water Test".

2. The 7.5-inch barrel PVAR rifle is an excellent alternative to the 9mm submachine gun/machine pistol in such a way that the PDW model PVAR in caliber 5.56mm has greater stopping power, has longer effective range (50/100 meters for the 9mm versus the 460 meters for the 5.56mm) and it has the same ammunition as our standard M4, M16A1 or M16A2. The 7.5-inch PVAR would be an excellent weapon for CQB operations specially if a fragmentation type of ammunition is used.

Needs Improvement:

1. The carbine can fire the M193 ammunition but not the M855 (SS109) ammunition.

2. The piston rod assembly was not sturdy enough to withstand sustained firing up to 5,000 rounds.

3. The bolt carrier group (BCG) has a tendency to loosen up the two Allen screws on top of the solid gas key.

It is noteworthy to mention that a parallel evaluation of the PVAR rifles were conducted by the Philippine Army Research Development Center (PARDC) during the same period (**Tab C**).

III. UDMC's second generation PVAR model

Equipped with the results, observations and recommendations by both NAVSOG and PARDC, UDMC produced their "Second Generation" PVAR assault rifles which were again subjected to test and evaluation on 7 May 2010 at HNAVSOG. UDMC submitted five (5) units of 14.5-inch barrel PVAR assault rifle with the following serial numbers: 5619277, RP018581, RP018327, RP016910 and RP049819. Shown below are several details of the second generation PVAR:

1. Ammunition Used: RPA M855, SS-109 (provided by Navsog), Govt Arsenal M193 (provided by Navsog), Armscor Ball Ammo, 55 grains (provided by UDMC) and Reload Ball Ammo from True Weight (provided by UDMC)

2. Barrel: Chrome-lined bull barrels manufactured by Roggio Arsenal from USA with rifling twists of 1X7.

3. Bolt: Standard Colt bolt and bolt carrier assemblies converted to PVAR with a solid gas key.

4. Buttstock: Standard M16A2 buttstock for the 16-inch barrel units and retractable buttstock for the 7.5-inch barrel unit.

5. Handguard: One-piece quadrail with milspecs picatinny rails made by UDMC. Floating-barrel style which eliminates barrel vibration.

6. Action: Patented PVAR gas-piston assembly of hardened special steel. Two-inch length piston spring made of square wire rolled, hardened and shot-peened.

7. Plating: Nickel plating of the bolt/bolt carrier assembly. Nickel plating of the PVAR action assembly. Nickel plating resists corrosion from sea water and other elements.

When the undersigned assumed command of NAVSOG at the end of May 2010, I recommended to the Flag Officer-In-Command, RADM Danilo M Cortez AFP, which he approved in August 2010, to send the second generation PVAR prototypes to Naval Special Operations Unit Six (NAVSOU 6) for field testing. Hence, LCDR [redacted] PN (CO, NAVSOU 6) issued one each to the different SEAL teams. After One (1) month of field testing, NAVSOU 6 submitted a report with the following finding:

1. Front and rear sight are not resting rock solid. They have the tendency to move thus adding to the inaccuracy of the rifle.

2. Front sight pins jump out while adding to sight movement. One front sight lost a lock pin thus it moves up and down while firing the weapon.

3. Rear sight pins were also lost thus the windage knob unintentionally adjusts and the base move back and forth.

4. The forward grip does not lock. The forward grip material easily tear and break rendering the forward grip unfit for CQC.

5. High temperature is observed at the quad-rail. Further inspection discovered that hot gases are vented sideways thus causing temperature build-up. The gas temperature and pressure might damage electronic devices like laser aiming devices.

6. Rib panel easily break.

7. The T6 aluminium used for the quad-rail is soft. It is easily deformed thus posing problem in attaching and detaching devices with rail grabbers.

8. Pneumatic valve lock disengages and twists unintentionally. It jumps out of the rifle during prolonged firing. A loose pin found in the valve lock was also observed.

9. Closer inspection of the bullet holes on the target indicate loose bore. The barrel should be able to withstand thousands of rounds and still maintain its accuracy before being replaced.

10. Loose gas block. Gas block moved such that the gas port of the barrel is no longer aligned with thegas block port.

11. During the initial range firing, one rifle "single shot" due to the deformation of the gas-piston assembly. The gas cylinder expanded and the piston is jammed inside, thus manual manipulation of the charging handle is required to chamber a load.

IV. UDMC's third generation PVAR model

Equipped with a new set of findings, NAVSOG and UDMC went back to its research and development to address some of the remaining concerns that needs correction and/or improvement. To help with the R&D of UDMC, NAVSOG sent LTJG [redacted] PN, a team leader from NAVSOU 6, to help UDMC in perfecting the design of the PVAR. He was also tasked to submit recommendations on all aspects of the design and process engineering portions consistent with the Co-Research and Development between NAVSOG and UDMC.

For the whole year of 2011, NAVSOG and UDMC continued to test and evaluate, piece by piece, each and every part of the PVAR. From conventional

machining equipment, UDMC invested in precision CNC machining centers, the "computerized numeric-controlled" machines which utilizes micro-chips in producing the parts of the of the PVAR from scratch, the designs of which can only be achieved through computerized programming. This was the only way to achieve consistency and modularity in dimensions of the needed parts to make the PVAR function as designed and desired.

To ensure that the R&D team of NAVSOG and UDMC is in the right track, the undersigned only allowed them to work and improve on the Five (5) units used for the second generation PVAR. Hence, all the findings made by both NAVSOG and PARDC on the first and second generations PVARs were considered and inputted in the 5 units to come up with the third generation PVAR.

Part of the improvement made by NAVSOG and UDMC during this period was when it re-engineered the bolt. With the use of the new CNC machine, UDMC made the one-piece monolithic Bolt Carrier Group (BCG) with a solid punch key as an integral part of the BCG main body. Both the piston assembly and the BCG are hardened and tempered to make it literally unbreakable. Furthermore, UDMC has now standardized with the Daniel Defense barrels in either chrome moly vanadium (CMV) or stainless steel.

Using the UDMC underground firing range in their new location, the joint R&D team fired more than 7,000 rounds of assorted caliber 5.56mm ammunition in Three (3) units of the PVAR with a 14.5 barrel. Rounds that were used were the M855 (SS-109) from the US SEALs and M193 from the DND Government Arsenal and Armscor plus reloads and training ammos.

In November 2011, the joint R&D team achieved a breakthrough when it finally assembled the Five (5) units of the third generation PVAR. With the positive results of this testing, the joint NAVSOG and UDMC R&D team presented to the undersigned the third generation PVAR assault rifle for further tests and evaluation.

Noteworthy to mention again is UDMCs submission of the third generation PVAR to the Philippine Army Research and Development Center (PARDC) for evaluation on November 2011 and the result was release by PARDC last January 2012. Result of PARDC evaluation is attached herewith under **Tab D**.

In January 2012, the undersigned directed the Commanding Officers of the SEAL unit, LCDR [redacted] PN (he was reassigned to this unit in mid 2011) and the Commanding Officer of the Naval Special Operations School, LT [redacted] PN, to undertake the NABSOG tests and evaluation. NAVSOG Evaluators randomly selected its personnel and allowed them to fire the rifles.

V. Result of NAVSOG evaluation on UDMC's third generation PVAR

For the last Three (3) months of this year, NAVSOG has made the necessary torture and endurance test of the third generation PVAR and is now ready to release the result of its evaluation.

NAVSOG utilizes a consolidated total rounds fired from the various venues and sources and was able to test each third generation PVAR with more than 7,000 rounds for each rifle. Different types of manufacturers and grains (55 and 62) of the 5.56mm X 45mm NATO ammunition were used such as the M193 and M855 (SS-109) from LCC, TZZ, DND Arsenal and Armscor. The venues and sources are as follows:

a. NAVSOG firing range using NAVSOG ammunition in the armory plus the LCC ammunition provided by the US SEALs during the Flash Piston 12-1 exercise.

b. DND Government Arsenal in Bataan during the Tactical Diving Course Class 03 marksmanship training.

c. Crow Valley range, Sangley coastlines and Caballo Island for field torture testing of the PVAR to mimic the desert (sandy), adverse condition at sea (water) and jungle or tropical condition (mud) were NAVSOG operatives usually engage the enemy forces in adverse conditions.

d. UDMC underground firing range using combat loads of the 62 grains M855 (SS-109) from the US SEALs, 55 grains M193 from the DND Government Arsenal and Armscor. Training ammunitions and reloads which has light powder loads were also used and mixed together with the combat loads to determine the self-regulating features of the PVAR.

NAVSOG's evaluators initial move is to test whether the R&D team considered the findings from the second generation PVAR which LCDR [redacted] evaluated in August 2010 at Western Mindanao AOR, hence, the result are as follows:

1. Front and rear sight are not resting rock solid. - A tertiary pin positioned deeper into the barrel rendered the front sight solid and the rear sights converted to the detachable carrying handle type.

2. Front sight pins jump out while adding to sight movement. - A sturdier design of the front sight replaced the detachable front sight.

3. Rear sight pins were also lost thus the windage knob unintentionally adjusts and the base move back and forth. – The rear sight on the detachable carrying handle design is of a sturdy design.

4. The forward grip does not lock. – Replaced with a stubby forward grip made of aluminium.

5. High temperature is observed at the quad-rail – Modifications were made in the valve design thus hot gases are vented forward.

6. Rib panel easily break. - Used a different material for the rib panels.

7. The T6 aluminium used for the quad-rail is soft. - Replaced the material for the quadrail with aircraft grade aluminum.

8. Pneumatic valve lock disengages and twists unintentionally. - Pneumatic valve lock design is modified to inhibit unintentional twisting.

9. Closer inspection of the bullet holes on the target indicate loose bore. – Used Daniel Defense chrome molybdenum barrels that could be used with M855 ammunition.

10. Loose gas block – Gas block pins were seated deeper into the barrel to restrict movement.

11. During the initial range firing, one rifle "single shot" due to the deformation of the gas-piston assembly. – Modifications in the gas cylinder inhibits the over pressurization of gasses in the piston and valve assembly.

Second, NAVSOG further findings reveals encouraging result for the third generation PVAR as follows:

1. Non-discrimination in ammunition. PVAR was able to fire all types of 5.56mm ammunition regardless of projectile weight (55/62 grains) and regardless of brand. Even the reload ammunition was able to cycle with noted differences in cyclic rates without any adjustments in the rifle.

2. Minimal muzzle flash. Rifles were fired at night and notable reduction in flash signature was observed.

3. Reduced recoil. The rifles tested have a shortened phantom flash hider and not a muzzle break or compensator yet still exhibits reduced recoil allowing firers more control and faster target acquisition.

4. Instead of measuring the Cyclic Rate of Fire (CRF), NAVSOG evaluated the ease of firing the PVAR on single, short bursts and on full automatic modes. All shooters agreed that both the muzzle rise and felt recoil have been substantially reduced, thus, resulting to a faster sighting of the target both at close range and medium range. Bursts of 2-3 rounds can easily be controlled even if the selector is on full automatic, this is due because PVAR system utilizes mechanical energy to cycle the round. Besides, a reduction in CRF is not an advantage specially when volume of fire is required in order to suppress enemy fire.

5. The one-piece quad-rail handguard enables a true "floating-barrel" that greatly aids in the consistency and accuracy of the fired round since the handguard was designed not to touch any part of the barrel at any point along the barrel's length except at the barrel extension. The barrel is mated to the rifle's upper receiver through the 20-hole barrel lock which also holds the handguard securely in place such that the barrel now "floats freely" without any contact with other rifle parts other than the rifle's barrel extension which is securely attached by the barrel lock to the upper receiver near the chamber. This minimizes mechanical pressure, distortion, and vibration throughout the length of the barrel when a round is fired.

6. While the barrel generated the same heat build-up as the standard direct gas-impingement system, it was noted that the bolt and bolt carrier assemblies absorbed very little heat. After continuous firing several hundreds of rounds, the bolt/bolt carrier assembly was removed and the shooter can hold the assembly with bare hands, unlike in standard direct gas-impingement systems. This is attributed to the mechanically driven piston rod.

7. The PVAR System prevents much heat, carbon build-up, unburned powder, and dirt from being deposited inside the bolt assembly and the bolt carrier group. Compared to the conventional system, there is less downtime for cleaning.

8. Reduced Field Maintenance. The PVAR system eliminates the constant cleaning requirements of the AR, M16, M4 and similar rifles in the field. While the conventional design requires general cleaning of the operating parts, the PVAR system require minimal cleaning.

9. Easier Takedown and Assembly. The PVAR system can be easily removed from the front of the gas block, taken-apart, cleaned, and reassembled in the field in a matter of seconds. The PVAR valve, piston rod and spring can be removed from the front of the gas block without special tools and without dismantling the whole upper assembly.

10. Reliability Under Adverse Battle Conditions. The PVAR Rifle can fire reliably even with sand, mud and water inside its system and mechanism. The shooter was instructed to totally submerge with the rifle under water and then fire on semi and full auto immediately after the shooter has emerged from sea water without waiting for the water to be drained out of the system. No malfunctions encountered. The "under-the-sea" test (fired under water) was performed only in semi-automatic for safety considerations.

11. The PVAR has inter-changeability and modularity of parts because CNC machines are used to fabricate the parts. As explained by UDMC, they can guarantee "repeatability" of manufactured parts up to plus/minus 3 microns. UDMC has demonstrated this feature when, after firing several hundred rounds, the parts (PVAR action parts, bolt, bolt carrier, springs) were dismantled, mixed-up, interchanged and re-assembled with no malfunctions when firing was resumed.

12. Most importantly, the PVAR functions safely, reliably and accurately in the adverse fighting environment of the NAVSOG. NAVSOG believes that the PVAR has the combined quality features of the M16 (accuracy) and the AK-47 (reliability) plus its (PVAR) advantage to utilize the M16 platform which is the platform of the AFP's 1960's era Colt/Elisco rifles.

VI. Conclusion

With the above findings and after 27 months of researched and development both by NAVSOG and UDMC, NAVSOG is now ready to endorse PVAR assault rifle with a 14.5-inch barrel as its weapon of choice.

VII. Justifications / Reasons for NAVSOG's choice of PVAR

During the operation of JSOG in Jolo were Seal Team 3 of NAVSOU 8 together with 3LRC were given a mission to: conducts raid at a known ASG lair at Brgy Ipil, Maimbung, Sulu on 040200February 2008 in order to prevent them from conducting terroristic activities in the province of Sulu. This mission resulted in an encounter with ASG while Seal team 3 is still in the mangroves area. Five of their CAR15 assault rifle experienced mechanical failure due to the personnel firing the gun as soon as they break the water surface coming from underwater hiding. As a result, Five (5) of the Seals got wounded and One (1) was killed in action. Part of the recommendation of the team leader on his after battle report under para 7 is: "NAVSOU-8 requires new weapons to successfully execute combat operations in a harsh maritime environment". This paved the way for NAVSOG to look into a better alternative weapon, one that can operate in the harshest and diverse combat operating environment.

NAVSOG believes that The UDMC PVAR Rifle incorporates the strengths of both the AK47 (reliability) and M16 (accuracy and lightweight) assault rifles. The following are the justification of the above statement as per NAVSOG evaluations for the past 27 months.

1. Controllability	No muzzle rise and negligible recoil than the conventional direct gas impingement system thus making the rifle more controllable both in semi and full automatic modes of fire.
2. No Cook-Off	No cook-off and no bolt/barrel overheating. Can be fired indefinitely in excess of 5,000 rounds with a brand new barrel in a period of 7-8 hours. Tested by the PNP-SAF, Phil Army's Research & Development Center, the PNP's Research & Development No cook-off after continuous firing in FULL AUTO of 240 rounds (8 magazines).
3. Endurance and Durability	Passed 10,000 rounds endurance and reliability and torture tests. PVAR design enables the rifle to fire full automatic with water inside and outside the system immediately after the user and rifle emerges (from totally submerged position) from water.

4. Operation	PVAR is cleaner and cooler in operation as compared to the traditional direct gas impingement system after continuous firing of 5,000 rounds in semi and full automatic modes. PVAR model has no heat build-up in the bolt carrier and bolt head assembly. No dirt and other carbon deposits.

The PVAR rifle presents itself as a better alternative to the conventional M16 platform and other foreign brands in terms of accuracy, reliability, endurance, safety, life cycle and ease of operation for the reasons cited above, not to mention that UDMC is a local company that can back-up its warranty with a manufacturing facility in the heart of Metro Manila.

Furthermore, UDMC's PVAR System has already a patent for its rifles under Patents No. 1-2009-000176 and 1-2011-000062. All raw materials used from the U.S. and Europe-sourced are properly certified. For example, UDMC uses only T6-7075 aircraft aluminium forgings in its lower and upper receivers, quad-rail hand-guards and charging handles from KAISER and forgings made by BAFE from Ferndale, Michigan. UDMC bolts and bolt carrier uses only Carpenter 158 alloy steel. Its barrels are head-spaced for the real 5.56mm X 45mm NATO that uses both the M193 and M855 or the so-called green tip SS-109 ammunition.

UDMC has committed the following under their Circular of Reference (COR) for both general and weapons specifications:

A. Circular of Reference, General Specifications:

1. Target Detection / Identification and Accuracy	PVAR rifles designed to enable the user to detect / acquire and distinguish targets from a distance of at least 200 – 400 yards. Weapons have an effective range of at least 200 yards for the 11.5-inch barrels, 300 yards for the 14.5-inch barrels and 460 yards for the 20-inch and barrels. PVAR accurate with an average spread of not more than 4 inches at 200 yards for the 20-inch barrel (longest barrel) and average spread of not more than 4 inches at 50 yards for the 8-inch barrel (shortest barrel).

2.	Durability	PVAR can be operated under adverse tactical conditions in sea, desert and jungle conditions. Upper and lower receivers made from T6-7075 (aircraft-grade) aluminium and other components made of high-grade steel and alloys and can withstand normal shock and drops, operational / storage temperature, weapon vibration and corrosion. Metal certifications available upon request.
	2.1 Temperature	PVAR can withstand operational and storage temperature ranging from minus 10°C to 70°C.
	2.2 Shock and Drops	PVAR can withstand normal pounding when attached to the user's Load Bearing Equipment. Further, weapons can withstand a drop from 6 feet and can withstand sustained weapon firing vibration of at least 5,000 rounds.
3.	Compactness and Portability	PVAR designed to ensure that its weight and dimensions do not affect the user's mobility and maneuverability and allow ease in movement, tactical maneuver and carrying.
4.	Universality	PVAR is exactly the same as the M16 platform thus commonly utilized in armed forces of most countries. The user should have no difficulty in adjusting to the handling, operating and maintenance procedures as in the M16. Except for the PVAR assembly, all other parts interchangeable and modular with the other parts of the M16 and M4 rifles. All parts must have a maximum tolerance of +/- 3 microns to allow interchangebility of parts.
5.	Reliability	PVAR will not malfunction when subjected to its intended and specified usage and do not mechanically malfunction and maintains accuracy in a sustained fire of 1,000 rounds and an endurance test of 5,000 rounds.
6.	Protection and Operational Security	PVAR designed for adequate protection against enemy detection and do not pose hazards to the user.
7.	Ergonomics	PVAR designed to fit the anatomical feature of the user and have provision for adjustments.

8. Maintainability	PVAR simple to operate and maintain. No tools required for cleaning the bolt and BCG assembly and the piston mechanism. No carbon build-up in the chamber, bolt head, and bolt assembly. The piston rod can be taken down from the front side of the triangle gas block without the need of removing the handguard.
9. Sustainability	UDMC to support the logistical program requirements of the end-user including NAVSOG weapons R&D.
10. User's Operating Manual	Each rifle comes with a User's Operating Manual
11. Maintenance Manual	Each rifle comes with a User's Maintenance Manual
12. Serial Number	Each rifle is marked with a unique and distinct serial number at the lower receiver.
13. Warranty	UDMC has its own production facilities as a duly-licensed (by the PNP-FEO) weapons manufacturer and not as mere gunsmith, assembler or dealer. In order to assure quality of work, UDMC does no sub-contracting to other companies of production works for major parts except for the barrel which are produced in the USA. All parts of the gas-piston assembly are made in the Philippines and not from other countries consistent with the AFP's program on Self-Reliant Defense Posture (SRDP). To back-up its warranty claims, UDMC can show proof that it has the capability to produce brand new weapons, repair, restore and/or upgrade said weapons with its own manufacturing facilities in Paranaque City. UDMC must guarantee that it will repair/replace the defective parts supplied by them, free of charge, within one (1) year from the date of turnover of the units (except for the barrel).

B. Circular of Reference, Weapon Specifications

1.	Caliber	5.56mm X 45mm NATO
2.	Ammunition Type	PVAR can be fired using ammunition from the DND Bataan Arsenal, Arms Corp. of the Philippines, Lake City U.S.A., U.S. forces ammo and from other foreign ammunition manufacturers from USA, Israel and Africa, among others. Fires both M193 and M855 green tip ammo SS - 109.
3.	Operating Principle	Patented PVAR Short-Stroke Gas-Piston System
4.	Bolt System	Rotating Bolt. Bolt carrier has a solid punch key. Carrier is one piece and machined from a 2-inch solid bar.
5.	Feed Mechanism	Magazine fed (20, 30 and 100 rounds)
6.	Cartridge Case Ejection	Right with case deflector
7.	Modes of Fire	Sustained Fire: Full-auto and Single Fire
8.	Barrel	14.5 inches
	8.1 Other Available Lengths	7.5 inches 11.5 inches 16 inches 20 inches
	8.2 Type	Chrome Molybdenum or Stainless with rifling twist of 1x7.
9.	Weight bare (14.5-inch barrel)	4 Kgs.
10.	Over-all Rifle Length (14.5-inch barrel)	36 inches
11.	Magazine Well	Flared for easy insertion
12.	Safety	Frame-mounted left side (standard) but with option for ambidextrous model
13.	Flash Hider	Phantom or Bird Cage
14.	Trigger Pull	34N ± 2N

15.	Rate of Fire	Average of 750 to 900 rounds per minute and if fired on full auto, 2.5 to 3.0 seconds for every 30 rounds.
16.	Upper Receiver	M16 platform. Scope-mount ready (flat rail) Mil-specs A3 flattop upper receiver made from 7075-T6 alloy (U.S. certified aircraft-grade alloy).
17.	Lower Receiver	M16 platform. Mil-specs lower receiver made from 7075-T6 alloy (U.S. certified aircraft-grade alloy).
18.	Charging Handle	Ambidextrous, left-side latch
19.	Sights	Adjustable front sights integral to the triangle gas block (A1/A2-style) Adjustable rear sights integral to the detachable carry handle. Optional: Flip up and flip down sights (for optics use)
20.	Sound Suppressor Interface	Capable but optional only.
21.	MIL STD 1913 Rails	Mil-specs picatinny rails, quadrail handguard made from T6 aircraft alloy. One piece handguard floating type to aid in eliminating barrel vibration. With rubber or thermo-plastic heat-protector or vertical/angle grip.
22.	Pistol Grip	Ergonomic
23.	Buttstock	Choice of retractable or fixed (A2)
24.	Buffer	Heavy recoil-reducing buffer made of stainless steel. Movable weights inside the one-piece stainless steel housing.
25.	Recoil Spring	Parkerized steel or Stainless steel

VIII. Recommendation:

Based on our evaluation of the PVAR assault rifle strengthened by our involvement in the research and development of UDMC for the past 27 months and the above stated commitment of UDMC to PN, NAVSOG recommends the following:

1. Refurbishing and upgrading to PVAR system all unserviceable and old M16 rifles in NAVSOG inventory. The PVAR upper assemblies from UDMC are 100% compatible with the Government Issue Colt/Elisco lower assemblies as proven by the tests. Hence, UDMC only needs to replace the upper receiver and the butt

stock with 6 position adjustable butt stock while NAVSOG retains the lower receiver. Based on present inventory there are [redacted] units broken down as follows: [redacted] *serviceable;* [redacted] *unserviceable; and* [redacted] *baby – unserviceable*.

2. That the refurbished and upgraded rifles must adhere to the specifications under Circular of Reference (COR) for both general and weapons specification at page 10 – 14 herewith.

3. If this paper merits your approval, NAVSOG further recommends endorsement to higher headquarters to directly talk with UDMC regarding details of and cost/price of the PVAR since NAVSOG have not talk to UDMC regarding cost/price per unit refurbished.

[redacted]

CAPT PN(GSC)

References:

A. MOA between PN and UDMC dtd 09 June 2010
B. Former Commander, NAVSOG evaluation report on first generation PVAR dtd 12 May 2010;
C. Philippine Army Research and Development Center (PARDC) report on the first generation PVAR dtd 27 April 2010;
D. PARDC report on the third generation PVAR dtd 09 January 2012.