



## **OPS-416 DROP-IN GAS PISTON SYSTEM**

for the AR15/M16/M4 Series of Rifles

### **WHITE PAPER**

TECHNICAL SUMMARY AND ANALYSIS

**Prepared for:**

Patent Pending

Proprietary Information: Not for Public Disclosure Without Written Permission

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# The OPS-416 Gas Piston System

## Background

The basic operation of the M16 rifle family is relatively unchanged since the introduction of the original M16 in the 1960's. While improvements have been made to the barrel, trigger system, and sights, the use of gas from the barrel to activate the bolt remains much the same over the past 40 years. The platform is in need of a reliability upgrade to improve soldier safety and survivability.

In a recent reliability test of the standard US Military M-4 carbine, the 10 M-4 rifles tested had 882 stoppages over a total of 60,000 rounds fired even with regular cleaning and wear item parts replacement during testing. This equates to an average of one stoppage or failure every 68 rounds fired cumulatively. This was more than 3.5X the failure rate of the next worst competitor.<sup>1</sup> While there are a few gas piston conversion kits available, most require the permanent modification of the host rifle and the replacement of barrels, sights, upper receivers, gas blocks and several other parts. In many cases these exceed the cost of the host rifle they are installed on. Dedicated gas piston rifles are extraordinarily expensive and wide scale military adoption of a completely new rifle platform during economic downsizing is unlikely in the near future.

The current production Osprey Defense OPS-416 Gas Piston Conversion System is the most cost effective and reliable solution to provide gas-piston functionality and reliability to an existing military spec M16/M-4 carbine, using the existing components of the rifle and simply exchanging the gas tube and bolt carrier with the Osprey Defense OPS-416 unit. The OPS-416 can be installed by the soldier in the field in minutes without any permanent modification to the gun and will outlast the useful service life of the rifle it is installed in, all for about 1/10th the cost of a new gas-piston rifle. The OPS-416 is available for carbine length, mid-length and full length rifles and uses no springs, no valves, and no screws.

## Limitations of Existing Direct Impingement Systems

The primary weak point in the design of currently issued direct impingement systems on the M16 and M4 rifle is the hot gasses and carbon from the expelled round are directed into the bolt carrier and receiver which must be spotlessly clean in order to operate correctly. This increase in temperature and contaminants causes the bolt/bolt carrier to fail in several areas of its function, and causes small parts in the bolt, bolt carrier, and lower receiver to wear and break down prematurely.

Another common problem is the overheating of the chamber. As the temperature of the chamber increases and carbon accumulates, this can cause spent shells to adhere to the inside of the chamber and preventing proper extraction of the spent cartridge case. The introduction of even the slightest amount of sand or other debris can cause an instant failure in hostile inclement environments when the rifle is needed most.

For an automatic direct impingement rifle to cycle properly, it is important for the bolt/bolt carrier to be properly lubricated to prevent carbon build-up in the direct impingement system. In a dirty environment, this lubrication acts like a magnet to foreign residue (i.e. dust, dirt, sand and other debris), causing function failures.

High pressure/flow in the gas tube can cause the tube to weaken and/or burst, resulting in a loss of pressure to push the bolt carrier rearward. This is potentially catastrophic for the operator.

## **Capabilities**

The OPS-416 is capable of increasing the mean rounds between failure (MRBF) counts up to 6,000 rounds. Osprey Defense has developed a system which performs a self-cleaning operation of the most critical area with every cycle. The system has no valves, no springs and no screws which means simpler-is-better reliability. The OPS-416 gas-piston operation prevents hot expelled gasses and contaminants from being re-introduced into the chamber of the rifle which dramatically increases mean rounds between failure. We put the gas where it belongs, out of the muzzle.

Osprey Defense performed tests with water, dirt, sand, ice, and high altitude drops.

During physical testing and development over 500,000 rounds have been fired through the system on host platform Colt M16 and M4 rifles and several other Mil-Spec rifle manufacturers. In addition to physical testing, a significant amount of computer simulation has been performed to optimize the shape of the system components, select the most robust and longest lasting materials, and determine manufacturing tolerances.

The unique kidney shape of the piston allows for much greater surface area than any other gas-piston system on the market. This unique shape combined with the unique chamber design allows for a non-valved metering of gas which only allows it to accept what it needs to correctly operate the rifle.

Current test results show the system is capable of firing as much as 14,080 rounds without a single system-related jam or failure and with no cleaning performed on the OPS-416 during these strings of fire.

## **Advantages**

The OPS-416 Gas Piston Conversion System is designed to convert Mil-Spec direct impingement M16/M4 rifles to a more reliable gas-piston operation. The advantages of the OPS-416 over current direct impingement systems or total rifle replacement are:

- Cost. The OPS-416 is about 1/10th the cost of a new gas-piston rifle.
- Models to fit any standard US Mil-Spec M16/M4 carbine rifle platform without replacement of front sight, gas block, barrel or bolt.
- No permanent modifications means it can be purchased just like any other accessory for the M16/M4 rifle.
- Truly drop-in and self adjusting. No gunsmithing, fitting or tuning required.
- The OPS-416 system installs in about 5 minutes by the end user with simple hand tools.
- Virtually eliminates fouling of the receiver due to carbon buildup or debris which will instantly render gas impingement guns useless.
- The OPS-416 system eliminates contaminants introduced into the bolt carrier.
- Dramatically minimizes increases in temperature, reducing rifle wear and metal fatigue. You can fire 1,000 rounds and hold the bolt carrier from the OPS-416 in your bare hand.

- OPS-416 produces a noticeable reduction in felt recoil on M4 carbines and nearly non-existent felt recoil on full length M16A1/A2 rifles. This assists with new shooter training by eliminating shooter fatigue and flinching.
- Simplicity. If a soldier is capable of cleaning the weapon, they can install this unit.
- Unique and Patent Pending kidney-shaped self-cleaning piston and chamber design cleans itself every time it fires.
- Specifically designed and tested to handle the stresses of military M855 ammunition. Works with all SAAMI spec ammunition.
- Change between all 4 modes of fire without any valving, tuning or activation of any switches.
  - Automatic Fire
  - Semi-Automatic Fire
  - Suppressed Automatic Fire
  - Suppressed Semi-Automatic Fire
- Lower recoil improves second shot placement.
- Increase the useful service life of existing rifles in current inventory.
- Ensure longer useful service life of new rifles arriving in inventory.
- Provide a solution for US friends and allies worldwide who were given US Military surplus rifles in old outdated M16A1 configurations rather than have them upgrade to new rifles.
- The most significant reliability enhancement available for the M16/M4 rifle.



## System Description and Specifications

The specifications of the OPS-416 Gas Piston Conversion System are as follows:

**Description:** The OPS-416 is a true drop-in gas piston conversion system which replaces the gas tube and direct impingement operation of the AR15/M16/M4 family of Mil-Spec rifles.

**Weight:** The OPS-416 gas piston system, including bolt carrier is approximately 18.27oz. (0.518 kg). With the reduction of original parts from the rifle this equates to a net weight gain of only 2.02 oz. over a standard M4 rifle.

**Parts Count:** The OPS-416 actually **REDUCES** the overall parts count by 2 parts in the rifle when installed to factory specifications.

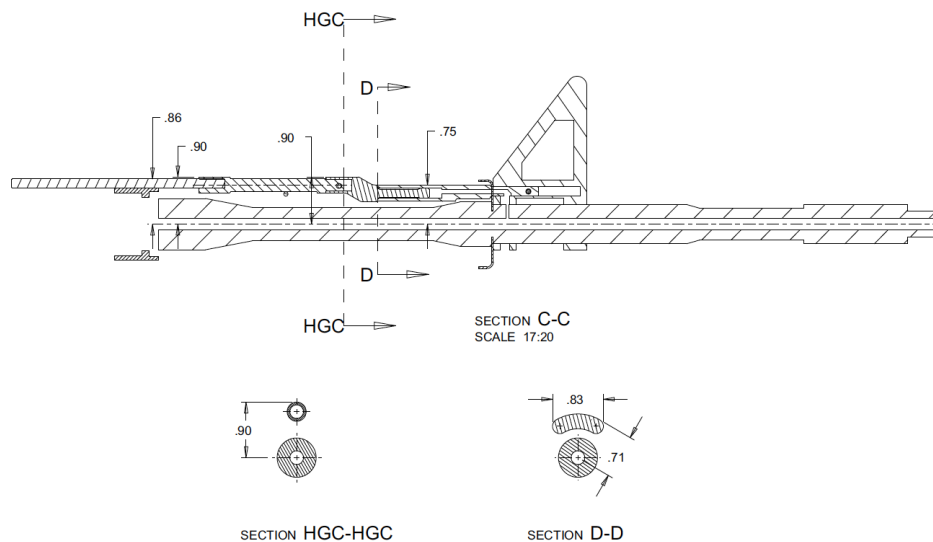
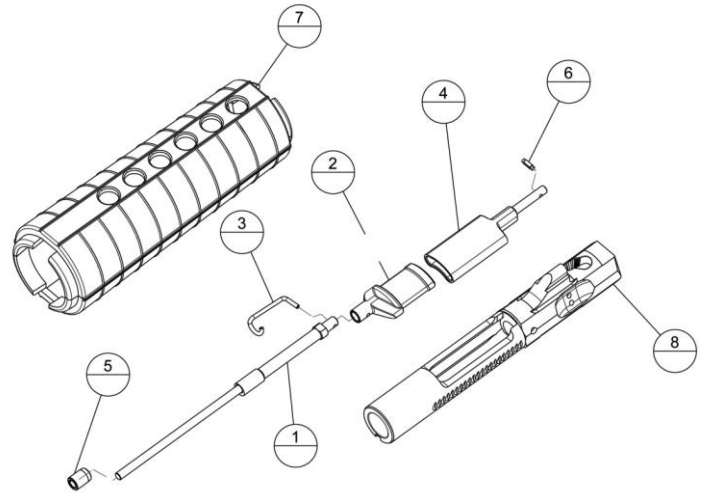
### Size:

The overall length of the OPS-416 gas piston system including key is approximately 15 5/16"

The overall width of the OPS-416 gas piston system 0.91"

The overall height of the OPS-416 gas piston chamber above the centerline of the bore is 0.75"

The overall height of the OPS-416 gas piston and operation rod above the centerline of the bore is 0.90"



## Major and Minor Components

**Major Components:** The OPS-416 gas piston system consists of 4 major components:

1. Op-rod Assembly
2. Piston Chamber Assembly
3. Piston
4. Solid Bolt Carrier

**Minor Components:** The OPS-416 gas piston system consists of 3 minor components:

1. Upper Receiver Guide Rod Bushing
2. Operation Rod Clip
3. Groove Pin



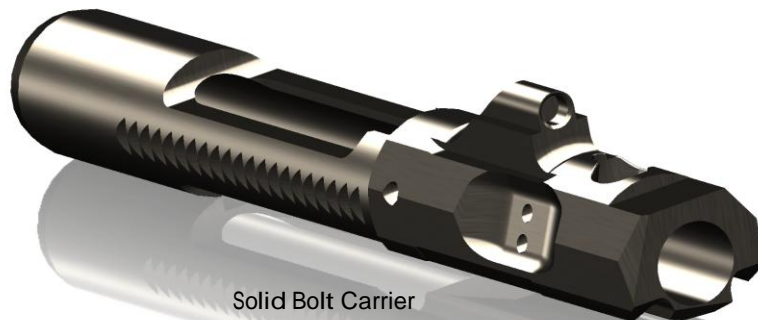
Piston Chamber



Kidney Shaped Piston



Operation Rod



Solid Bolt Carrier

**Materials:** The materials used in the OPS-416 system have been selected based on their strength and performance. The piston, chamber and solid key components are manufactured using heat treated, high strength steels to withstand the high gas pressures and cycle rates necessary to ensure maintenance free operation. The chamber and piston have special coatings to minimize carbon buildup and ensure smooth operation. The OPS-416 utilizes dissimilar metals to prevent galling. The finish of the OPS-416 current US Mil-STD MIL-DTL-16232 .

### Testing

Endurance testing was accomplished using the 6,000 round US Military endurance test with the only deviation being the installation of the OPS-416 Gas-Piston System on an otherwise Mil-Spec rifle and the disallowance of cleaning of the OPS-416 system during the entire endurance test. Testing was done with repetitive strings of 120 rounds, both automatic and semi-automatic fire in accordance with US Mil-Spec MIL-C-71186(AR)

Test Results from 6,000 round endurance test in accordance with US MIL-C-71186(AR) except for the installation of the OPS-416 Gas Piston System.

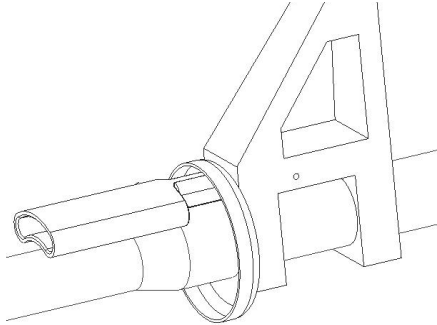
Host Firearm:	Colt M16 in M4 configuration
Test Date:	11/3/2009 - 11/4/2009
Oil Every:	600 rounds
Clean Every:	<i>No Cleaning of OPS-416 Allowed</i>
Rounds Fired:	6,000
Ammunition:	US Mil-Spec M855 from Lake City Plant
Avg. Muzzle Velocity:	2918 FPS
Avg. Cyclic Rate:	884 RPM
Stoppages During Test	1
Rounds Between Stoppage (operator clear):	3,000
Mean Rounds Between Class 3 Failure :	6,000 (no failure occurred)

Additional tests have included 10,040 rounds without system cleaning, 14,080 round test without system cleaning, and longevity testing in excess of 30,000 round stated useful service life of the M4 rifle.

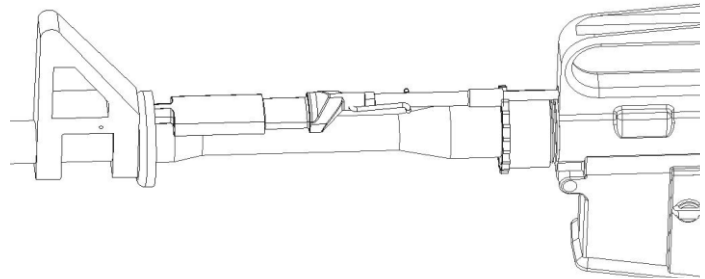


## Assembly

The OPS-416 system is easily assembled without special tools. For basic assembly, remove the hand guards, remove the gas tube and gas rings, replace the bolt carrier with the OPS-416 solid one piece bolt carrier, and install the chamber/piston into the front sight block. Next, install the operation rod, piston, then replace the hand guard or use a compatible rail system. The system is ready to commence firing. Assembly time for an experienced armorer is approximately 5 minutes.



Piston Chamber Installed



OPS-416 Installed

The OPS-416 is specifically engineered to automatically adjust to variance in rifle manufacturer tolerance differences through the use of an intentional forward pushing slip-fit of the piston chamber. This allows for the system to automatically adjust for varying overall rifle lengths as well as removing all load-bearing from the groove pin in the gas block. Forward forces act on the billet machined front face of the piston chamber and not on the pin which simply creates alignment for gas exiting the top of the barrel.



Complete OPS-416 System As Resides In Rifle After Installation

### **Production Capacities**

Our current production capacities for the OPS-416 Gas Piston system is 5,000 complete gas-piston systems per month. with +/- .001" tolerance hold. (one one thousandth of an inch) This can be accelerated to over 10,000 units per month within 90 days, and beyond that as needed.

The OPS-416 is a ready, affordable and already in production system with thousands of units already in use nationwide and a dealer network of over 250 dealers.

The OPS-416 system is built in ISO:9001-2000 certified facilities and is 100% built in the USA with no foreign parts.

### **Company Contact and Information:**

Osprey Defense is a small business located in Bradenton, Florida USA. For more information regarding Osprey Defense and the OPS-416 Gas-Piston System, please contact:

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