Big Bore Durability

This combination of new cylinders, Nickel+Carbide™ coated bores, barrel faced plasma coated rings, and mineral based AD oils, all working together, is the most durable new cylinder package RAM has ever offered!

- **Continental**
- **Lycoming**

The True Story About Nickel Cylinders

Steel Rusts!

Steel corrodes causing cylinder wear and blow-by that results in expensive cylinder changes, damaged cams and lifters, top overhauls, or worse, the loss of an engine.

Nickel Doesn't Rust!

RAM started using nickel cylinder bores in 1998. During all these years and over 25,700 nickel cylinders later we still have not had even one corrosion or wear-related problem.

You Need Nickel Cylinders!

RAM Nickel Cylinders incorporate the ECi Nickel+Carbide™ process of depositing a layer of Nickel / Silicon carbide onto the bore of a steel barrel. Silicon particles provide a wear-resistant surface, while nickel acts as the matrix to hold these particles in place. Nickel, proven not to corrode in any environment, and silicon carbide, proven tough and resistant to abuses of extreme heat – these elements, paired with plasma-coated rings and mineral-based ashless dispersant oil, make this cylinder far more durable and longer lasting than any other cylinder bore on the market today.

Uniformity of Composition

During the nickel plating process, silicon carbide particles are continuously blended into the electrolyte that is transferring nickel ions to the new steel barrel. As a result of this proprietary blending process, both the nickel and the silicon carbide are applied concurrently, intermixed like the aggregate in concrete. Such consistent mixing of the nickel and silicon carbide ensures a uniform blend across the entire cross section, thus providing an unparalleled level of wear resistance and corrosion protection. Over a TBO period, the bore wear surface remains consistently hard, oil wettable, and durable.

Plateau Bore Finish

The final operation in Nickel+Carbide™ coating process includes a carefully controlled, 2-step honing procedure so that a "plateau finish" is imparted to the bore surface. As the name implies, the finish consists of plateaus and subsurface valleys, which are essential to the ring break-in process, as well as proper lubrication of the ECi plasma-coated compression ring and bore interface system.

Plasma-Coated Top Compression Ring

Plasma faced piston rings are made from cast iron and have a groove on the outside periphery that is filled with a thermal sprayed metal/ceramic material. The sprayed material forms a porous matrix that holds oil and has self-lubricating qualities to minimize barrel wear at the top and bottom of the ring travel. After spraying, the periphery is machined to size with a barrel shape in order for the ring to create a wedge of oil as it rides up and down the cylinder bore. The ring design is an integral part of the excellent wear and oil control system. For the performance required of high BMEP engines, operating at high altitudes with extreme temperature variations, a plasma-coated top compression ring works best. It has a very low tendency to scuff, and at high temps, it forms oxides to create self-lubrication.

Cylinder Identity

The texture (surface finish) of the Nickel+Carbide™ coating is smooth by comparison to a traditional ring finish for steel. Except for loss of cross hatch, there is very little difference in appearance between a fresh RAM Nickel+Carbide™ Cylinder bore and a bore with several hundred hours of operating history. Externally, the area of the cylinder which normally receives a color code to indicate the type of cylinder bore material will be painted with two (2) silver bands.

Cylinder Bore Hardness Comparison

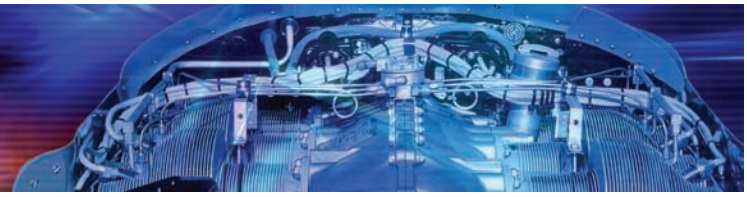
Nickel+Carbide™ is a coating consisting of extremely hard silicon carbide particles in a nickel matrix. The high hardness and oil wettability of the silicon carbide particles effectively prevents wear from occurring throughout the life of the cylinder.

Best Cylinder Warranty in the Industry

RAM Nickel New Cylinder Package cylinder assembly is warranted to be free from defects in material and workmanship (parts and labor) under normal use and service for a period of one year following the date of shipment from RAM. After one year, the warranty is pro-rata to that of the manufacturer's recommended time between overhaul (TBO) for the engine with a minimum accrual of 40 hours per month. Furthermore RAM warrants each nickel process cylinder bore to remain free of corrosion and wear beyond service limits in normal operating conditions during TBO, or for a period of five (5) years following date of shipment from RAM, whichever occurs first. RAM's obligation will be to repair cylinders with new limits nickel process bores and issue a new set of rings. This process does not include labor costs.

RAM Nickel New or Premium *ValueTime* Overhauled Nickel Cylinders are available for the following engines:

• TCM IO-520 • TCM IO-550 • TCM TSIO-520
• TCM GTSIO-520 • Lycoming Engines



Oil Recommendations

Mineral Oil and Mineral Based Oils

- Break-in procedures: RAM uses Mineral Oil
- Normal operations: RAM uses Mineral Based Ashless Dispersant (AD) oils

Ashless Dispersant (AD) Oil

Ashless dispersant oil could be written as ashless and dispersant oil. There are two distinct features to remember about AD oil. Ashless stems from a requirement to clarify that the oil does not leave behind any ashes, or burning embers as it cleans. Decades ago in aviation history, oils that cleaned involved metallic cleaning particles that left embers. Such glowing metallic embers contributed to pre-ignition. Detergent oils have long since been removed from aviation piston engines. Aviation oils that clean are required to be ashless. When an oil has dispersant qualities, the particles created and removed by cleaning are suspended (dispersed) within the oil. Being dispersed, they are collected better by the oil filter. During the initial engine break-in period, RAM believes that AD cleansing is premature. RAM recommends a non-dispersant mineral oil during the initial twenty-five hour break-in period of an aircraft piston engine, or during a replacement cylinder.

Break-in Oil

Break-in procedures should be followed whether replacing one cylinder or six, and that includes using a multi-viscosity mineral oil such as SAE 20W-50 Phillips Type-M. The minimum break-in period should be considered the first twenty-five hours of operation (and can continue to as much as 100 hours depending on the cylinder bore material used). The oil should be changed as soon as oil consumption stabilizes, but no later than the first twenty-five hours of operation. At that time, oil should be changed to an ashless dispersant (AD) mineral based oil.

Single Viscosity - Mineral Based AD Oil

RAM recommends single viscosity mineral based (AD) oils such as: Aeroshell W100 and W100 Plus Antiwear (SAE 50 wt.) when typical ground level engine starting temperatures are not less than 40° F. When operating in colder environments Aeroshell W80 or W80 Plus Antiwear (SAE 40 wt.) and, of course preheating is recommended. RAM service history records indicate that mineral based AD oils perform significantly better than synthetic and semi-synthetic oils.

Multi-Viscosity - Mineral Based AD Oil

Differing operating conditions and/or availability may warrant the use of multi-viscosity oils. Most important to RAM is that the oil be mineral based. RAM recommends a multi-viscosity ashless dispersant mineral based oil such as Phillips 66 X/C 20W-50. RAM service history records indicate that mineral based AD oils perform significantly better than synthetic and semi-synthetic oils.

Preheat

Preheat is recommended when engine starting temperatures are below 40º F. Preheat equipment can be purchased through numerous aviation supply companies, as well as through RAM's Parts Catalog.

Oil and Filter Change

RAM recommends changing the oil every 25 hours or 4 months whichever occurs first. RAM prefers an oil filter change at each 25 hour oil change interval but certainly you should not exceed 50 hours before changing your oil filter.

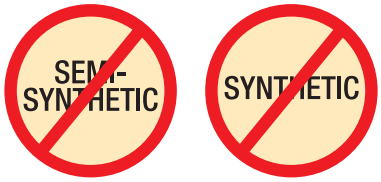
Frequent Oil Changes

- **Flush out metal particles:** Both Lycoming and Teledyne Continental Motors (TCM) engines include parts that have a proven history of normal wear that deposits normal wear particles of metal into the oil. Oil filters contribute significantly to capturing these wear particles, but not as effectively as frequently changing the oil.
- **Flush out acid contamination:** With four-cycle gasoline engines it is an unavoidable fact that acids collect in the oil. Acids are formed when combustion by-products and unburned gasoline leak past (blow-by) the piston rings into the crankcase. Acids are corrosive. They cause rust as well as pitting of lifter faces. Acids are not removed by oil filters or by changing filters. The only way to remove acids is to remove the oil that has become acid contaminated.

Oil Viscosity

- Points made are well taken on both sides of the issue of whether to use single or multi grade oils. In the final analysis, you know that your aircraft is subjected to extreme temperature variations and starting conditions. Many aircraft fly frequently. Many aircraft don't fly enough. Successes and lack of successes, suggests there is simply not one viscosity that is always the best for all flight environments. In general RAM sees the following:
- Multi-Viscosity Mineral Based (AD) oil performs well in high usage airplanes.
- Single Viscosity Mineral Based (AD) oil performs well in high or low usage airplanes.

Synthetic and Semi-Synthetic Oils vs. Mineral Based Oils



RAM service history records are much less favorable for engines that have a history of being operated on synthetic blends or semi-synthetic oil products. RAM encourages using mineral based (AD) Oils only, single or multi-viscosity as conditions require.

For more information about RAM Nickel Cylinders go to www.ramaircraft.com/nickel-cylinders.htm

Phone: (254) ***752-8381*** *• Fax: (254)* ***756-0640***

RAM Aircraft, LP is an aircraft engine overhaul facility and general aviation support center located at Waco Regional Airport in Waco, Texas. RAM was founded in 1976 with a focus on engineering airframe and engine improvements that provide many of general aviation's most popular airplanes with enhanced performance and reliability. This focus is reflected in every aspect of our business and remains a driving force behind the work of RAM.

Engineering Excellence

RAM has a long history of engineering excellence. RAM engineering has specialized in the TCM 520/550-series engines and the airplanes they power. Over the course of thirty one years, RAM engineers have earned approval for over 113 STCs (Supplemental Type Certificates) for engine, airframe, and propeller upgrades. We have also earned over 800 FAA-PMAs (Parts Manufacturer Approvals), allowing us to produce certified replacement parts that provide as good or better performance as the originals at significant savings. And most recently RAM has been certified by the FAA as a Designated Alteration Station (DAS). With these approvals and certifications, RAM engineers work continuously to improve existing STCs and PMAs and to develop, test, and produce new ones that will enhance the safety and performance of the fleet.

RAM Engines

Put RAM's experience to work for you. RAM has over 31 years of experience in overhauling and installing big bore Continental engines in both Cessna and Beech aircraft. One professional engine builder is devoted to building your engine from start to completion, under the supervision of RAM's full-time inspectors. Upon completion, each engine undergoes a break-in procedure in a computerized test cell to ensure that it conforms to our standards of performance. An average of 30 RAM OHE engines are kept in revolving inventory, allowing us to conform an engine to your airplane in a timely manner, with most engines being shipped out from our facility on the third business day after order placement (5th day international). RAM OHE engines can be shipped to airplane owners and installing FBOs. Some of the products and services standard on most RAM OHE engines include:

- RAM Nickel New Cylinder assemblies
- New RAM PMA High Efficiency Camshaft and Lifters
- Balanced Crankshaft and Rod Sets
- New Unison Components, including Magnetos, Harnesses, and Fine Wire Spark Plugs
- New RAM *SureStand* Baffle Seals
- New oil coolers
- More engine accessories included

Parts

RAM Aircraft is your best choice for quality airplane parts. RAM is an FAA and EASA-approved parts supplier and maintains a full-time Parts Sales Department staffed by professionals with aircraft maintenance experience. We have thousands of factory-new, factory-overhauled, vendor-overhauled, and PMA-new parts in stock and ready to ship, including engine parts and accessories, complete exhaust systems, airframe parts and accessories, and propellers to support Cessna and Beech piston-powered aircraft. RAM produces an annual illustrated parts catalog that reaches over 6,500 FBOs and 5,400 retail customers around the globe. Call today to request your copy, or browse the catalog online at www.ramaircraft.com. We also offer a free parts locator service. If we don't have the part you need, we'll find it for you free of charge! If you need a part shipped quickly and we have it in stock, we'll ship it the same day your order is placed at no extra cost to you (domestic shipping only). RAM ships worldwide with confidence and precision, so whatever you need, wherever you are, we've got you covered!

Upgrade Packages

RAM specializes in engine and airframe upgrades that result in benefits such as increased engine horsepower, additional useful load, and enhanced flight performance. RAM improvements are based on DER and DAR-engineered designs, strenuous flight testing, and FAA approvals. Our aircraft upgrade packages can be installed here at RAM or shipped worldwide to professional maintenance facilities in the form of Dealer Installation Kits. RAM upgrade packages are available for the following aircraft:

- Beechcraft Baron 58P/TC
- Cessna T310
- Cessna 340/A
- Cessna 414
- Cessna 414A
- Cessna 421C
- Piper PA28-140
- Piper PA28-151

Customer Service / Contact Us

We make ourselves available for our customers. When you call RAM, you speak with a live person who will make sure that you get the attention you need and deserve. Our full-time Customer Service Department staff is dedicated to answering your questions. They know our products and services, as well as your series of aircraft, by heart. Whether you are looking for a specific part, need information about RAM OHE engine set-up or warranty, or just have a question about your airplane in general, give us a call at (254) 752-8381. You can also visit our website at www. ramaircraft.com.

Warranty

At RAM, we stand behind our products and workmanship, offering you customer service after the sale with the best warranty in the business. Every aircraft engine overhauled at RAM is covered by our TBO Prorata Warranty Support Program, giving you prorated extended coverage including parts and labor. Individual RAM parts and accessories come warranted, as well. Our Customer Service Managers are always available to answer your warranty questions.

RAM™

RAM Aircraft, LP • 7505 Karl May Dr. • Waco, TX 76708 • (254) 752-8381 • Fax: (254) 752-3307 • www.ramaircraft.com