RBC AEROSPACE

ArmorGuard™

Stress Corrosion and Fretting Protection

Innovation. Commitment. Quality.

ArmorGuard™

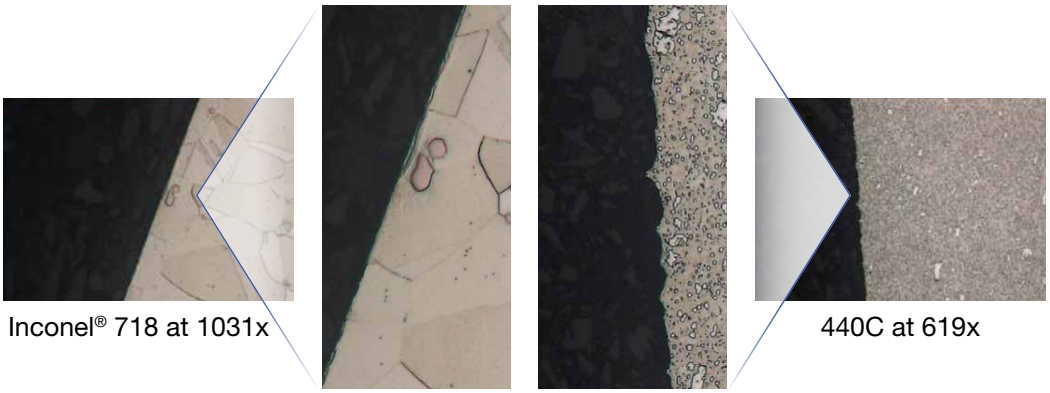
Stress Corrosion and Fretting Protection

The commercial aircraft industry has been challenged with preventing stress and fretting corrosion which could degregate the integrity of the structure and adversely impact its ability to carry its intended design loads. RBC Bearings as the leading Engineered Solutions Provider has developed the ArmorGuard™ series of plain bearings to significantly reduce abrasive ball damage from low stress, high frequency vibration. This new series is offered by the Transport Dynamics Division of RBC Aerospace who is the World Leader in Self-Lubricating Liner Systems™.

We have vigorously tested and validated the use of various material options with our proprietary liner systems in applications that have been susceptible to stress corrosion cracking. This effort has led to the introduction of ArmorGuard™ as an Engineered Solution.

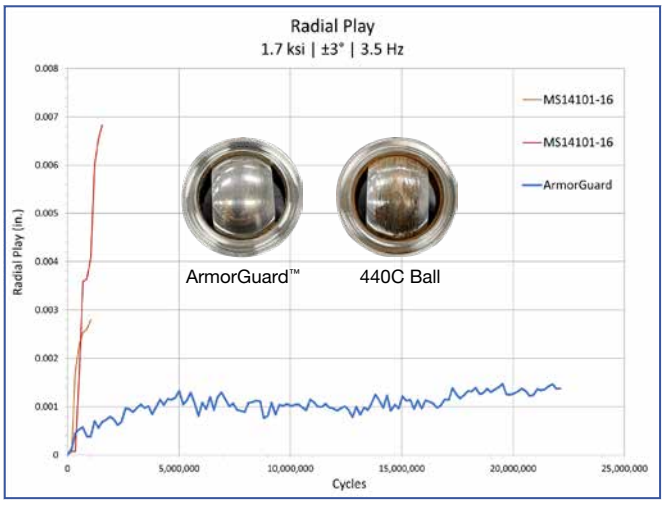
The use of an Inconel® ball with the RBC Fibriloid® liner has been tested at -65° F to +335° F to 22 million cycles. This testing was intended to prove out the ability to significantly reduce abrasive ball damage from low stress, high frequency vibration. The RBC ArmorGuard™ offering is able to operate in extreme environments from -320° F (Cryogenic range) to +450° F.

Vibration Testing Microscopic Images



Inconel® 718 at 1031x

440C at 619x



Performance Benefits:

- ✓ Superior wear life (>than 13x w.r.t. MS)
- ✓ Superior stress corrosion protection
- ✓ Superior elongation before break
- ✓ Cryogenic qualified
- ✓ No need to apply a secondary hard coating
  - Reduced cost
  - Shorten lead time
  - Minimize risk of F.O.D./Failure
- ✓ Meets AS81820 wear requirements

RBC AEROSPACE

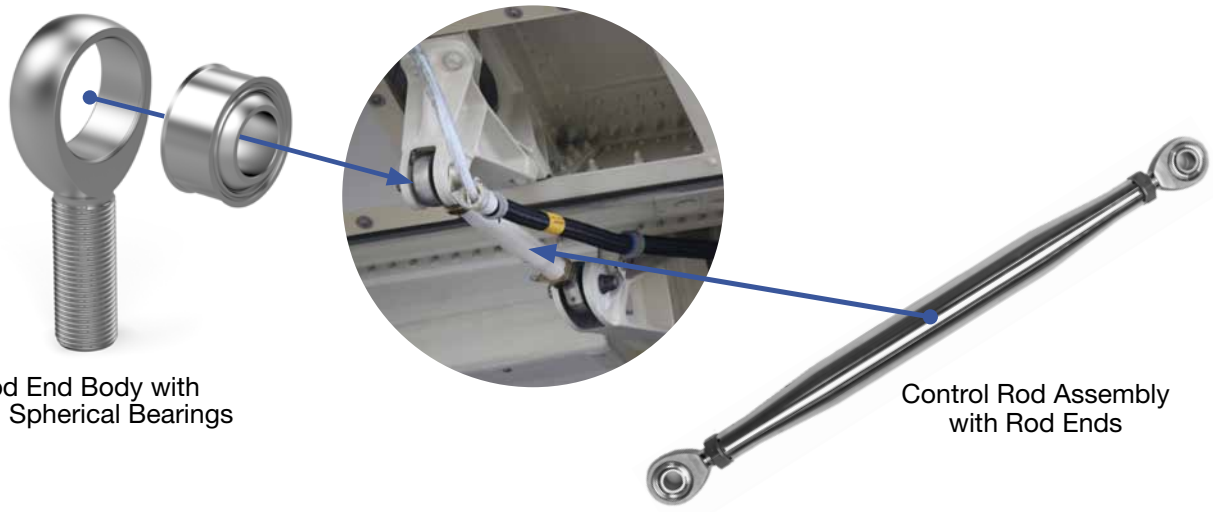
e-Mail: TDCRFQ@rbcbearings.com 714-546-3131 Ext. 1245 www.rbcbearings.com

RBC TRANSPORT DYNAMICS

The reality of the current airfoil wing designs restrict the available envelop for the flight control actuators and mechanical linkages. This necessitates more stringent performance requirement on the bearings, therefore reducing permitted wear limits and reducing the cross sections of bearings. The more aerodynamic, reduced drag air foils tend to be more unstable and require constant adjustment (dithering), compared to air foil designs of the past. Military aircraft flight controls also see similar challenges, especially on the stealth aircraft designs with unique wing foils, also creating the need to constantly micro adjust flight control surfaces for stability and smooth flight. This small angle oscillation can lead to increased fretting and ball damage that ArmorGuard™ Solution greatly reduces and can even prevent.

ArmorGuard™ has been flight tested and in-service today supporting space applications and flight control surfaces successfully operating at temperature ranges from -320°F to +450°F.

Targeted Applications:



Rod End Body with
Lined Spherical Bearings

Control Rod Assembly
with Rod Ends

Other Applications:

Commercial Fixed Wing	Rotary Wing
■ Thrust Reverser	■ Pitch Links
■ Blocker Door	■ Lead Lag Damper & Link
■ Engine Mount	■ Swash Plate
■ Landing Gear- Trunnion	■ Tail Rotor
■ Landing Gear- Uplock	■ Engine Mount
■ Landing Gear- Doors	■ Landing Gear

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RBC Bearings® has been producing bearings in the USA since 1919. In addition to unique custom bearings, RBC Bearings® offers a full line of standard industrial and aerospace bearings, including:

Spherical Bearings

- MS approved to AS81820 (formerly MIL-B-81820)
- Self-lubricating • Metal-to-Metal
- Loader slots • High temperature
- Low coefficient of friction
- Special configurations and materials

Thin Section Ball Bearings

- Standard cross sections to one inch
- Stainless steel and other materials are available
- Sizes to 40"
- Seals available on all sizes and standard cross sections
- Super duplex configurations

Journal Bearings

- MS approved to AS81934 (formerly MIL-B-81934)
- Plain and flanged • Self-lubricating
- High temperature • High loads
- Available in inch and metric sizes

Airframe Control Ball Bearings

- MS approved to AS7949 (formerly MIL-B-7949)
- Single and double row
- Radial, self-aligning, and pulley series
- 52100 Cad plated and 440C stainless
- Zinc Nickel plated

Ball Bearing Rod Ends

- MS approved to AS6039 (formerly MIL-B-6039)
- Various shank configurations
- Low coefficient of friction
- Advanced AeroCres® materials available

Rings and Seals

- Solutions for any pneumatic and hydraulic applications
- Seals from .5" to 55" diameter
- Cast Iron to Rene 41
- Precision machined & wire rings to tight tolerances

Specialty Fasteners

- Hollow Bolts, Fuse Pins, Solid Bolts (Standards), Customed Machined Parts & Nuts
- Hot Headed, Thread Rolled, HVOF Coated
- Large Diameter over 3/4"

Hydraulic Actuators

- 2-Position Fluid Hydraulic
- Auto or Manual Mechanical Locking
- Lock Sensing/Position Sensing
- Flow/Directional Control Valves; Solenoid/Manual

Rod End Bearings

- MS approved to AS81935 (formerly MIL-B-81935)
- Self-lubricating • Metal-to-Metal
- Loader slots • High temperature
- Low coefficient of friction
- Special configurations and materials

Track Rollers

- MS approved to AS39901 (formerly MIL-B-3990)
- ATF single row and ATL double row
- Sealed with lube holes and grooves
- Heavy duty cross sections
- Advanced AeroCres® materials available
- Lined track rollers available

Cam Followers

- MS approved to AS39901 (formerly MIL-B-3990)
- Advanced AeroCres® materials available
- Maximum corrosion resistance
- Superior lubricants & seals to reduce maintenance

Load Slot Bearings

- Spherical and rod end designs
- Superior ball-to-race conformity
- Reduced maintenance cost
- Variety of race materials available

Specials

- Many specialty bearings, custom-designed and configured for diverse aerospace applications
- Capability for advanced aerospace specialty corrosion resistant and high temperature materials

Control Rods

- Swaging up to 14' length and 4" dia
- Nadcap and customer special process approvals including NDT
- Surface treatments, CNC Machining, Flash Welding, Aluminum Heat Treat
- Design and build to print

Ducting Solutions

- Solutions for pneumatic ducting
- Patented couplings
- Temperatures 450° to 1,500°F
- Engines, Aircraft, APUs

Machined Components

- Exotic materials • 3, 3.5, 4 and 5 Axis
- Horizontal and Vertical Milling
- Lathes, Hot Head, Gearing, Heat Treat, Special Processes

AIRTOMIC® AeroStructures™ KAHR® Bearing PROGRESS THROUGH PRECISION HEIM® BEARINGS RBC® AEROSPACE TRC RBC TRANSPORT DYNAMICS SCHAUBLIN® SARGENT CONTROLS & Aerospace™ Industrial Tectonics Bearings

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