



# AVIATION CASE STUDY

## HELICOPTER MAIN ROTOR SWASHPLATE





OMNISEAL® ROTARY LIP SEALS

## Helicopter Main Rotor Swashplate

Arnaud Verger January 2022

AVIATION HIGH SPEED LOW COEFFICIENT OF FRICTION DRY RUNNING DURABILITY

### Environment

Flying a helicopter in an unpredictable and changing environment such as the desert or above the sea can lead to the accumulation of several kind of potential, aggressive contaminants, which are not clearly visibly on the bearings of the main shaft of a helicopter rotor. These damaging substances may cause jamming, ultimately leading to crash. The sealing of the swashplate is critical as it protects this aviation equipment from dust, sand and debris.

### Challenge

The swashplate is connected to the main mast, which requires a very large rotary seal, up to or beyond 50 cm (20 inches). The speed of the shaft is variable and can reach fairly higher surface speeds (9 m/s or 1,700 ft/min). Because of its critical location, no leakage can be allowed, and environmental protection is mandatory to avoid any pollution of the bearing cage below.



**Omniseal Solutions**  
SAINT-GOBAIN

## Solution

Omniseal® rotary lip seals are able to accommodate very large sizes (more than 50 cm or 20 inches), featuring a wiper to protect the mechanisms below from any debris or pollutant. The design of the seal may help to retain the bearing cage and prevent any leakage for more than 1,000 hours.

Should the oil level be not high enough, the seal has the ability to run dry for a considerable amount of time. Our customer trusts our polymer lip seals due to their low coefficient of friction and low wear rate at high rotary speed with improved sealing performance.



## Protecting the people who work every day among the skies

### Benefits

- Acts as a rotary seal on the swashplate to retain oil in contact with a high speed rotating shaft
- Wiper design prevents dust and particles from coming into the bearing cage
- Design allows retaining of bearing cage in order to simplify and reduce the total weight of the system

### Specification

- |                       |  |
|-----------------------|--|
| <b>Solution</b>       | • Omniseal® Polymer Rotary Lip Seal, Series 31 |
| <b>Area</b>           | • Helicopter Swashplate                        |
| <b>Material</b>       | • High-Performance Polymer Material A27        |
| <b>Precision part</b> | • Custom Lip Seal                              |
|                       | • Media: Jet Oil                               |
|                       | • Temperature: -55°C to 71°C (-67°F to 160°F)  |
|                       | • Speed: up to 10 m/s (higher possible)        |
|                       | • Pressure difference: Up to 20 PSI (1.4 BAR)  |
|                       | • Counter face: Chromium hardened shaft        |
|                       | • Shaft diameter 50 cm or beyond (20 inches)   |

### Technical details



## Design Expertise & Tailor-made Solutions for Your Critical Applications

Omniseal Solutions™ is a global engineering leader with over 65 years of historical legacy, relentlessly dedicated to the design and manufacture of precision sealing and material solutions that protect critical applications in the most demanding environments and passionately driven to push *Beyond the Boundaries of Possible*.



### About the Author

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