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BEYOND
the boundaries of possible

# SPACE CASE STUDY

## LAUNCH VEHICLE LARGE FUEL TANK

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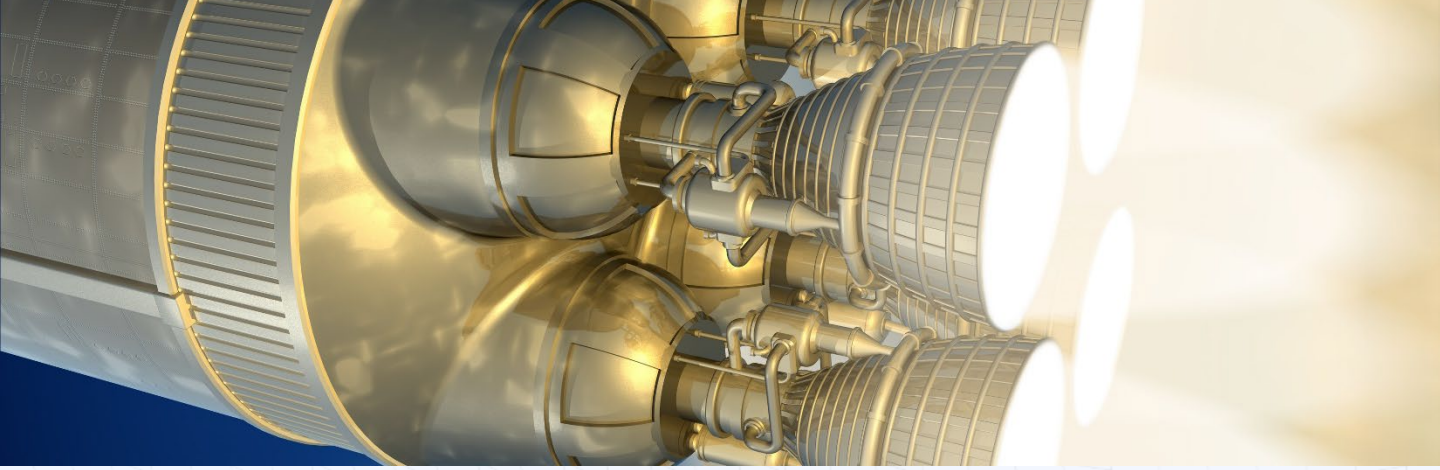

OMNISEAL® SPRING-ENERGIZED SEALS

# Launch Vehicle Large Fuel Tank

Chiara Repetto July 2021

SPACE & DEFENSE LEAKAGE CONTROL CRYOGENIC

## Environment

Launch vehicles are most often propelled using fluids with liquid oxygen being the most common oxidizer and fuel being liquid hydrogen or kerosene and most recently liquid methane. All these fluids (except kerosene) are commonly stored at cryogenic temperatures.

Sealing is critical when liquid oxygen or hydrogen are involved since they are easily ignitable. Any small amount of leakage can create a hazardous situation, which can lead to a potential explosion of the whole launch system. Leakage requirements are therefore quite stringent.

## Challenge

With the combination of cryogenic temperatures, large size and strict leakage requirements, at such extremes sealing becomes challenging!

Fluids are stored in very large tanks that are part of launch vehicles, which need to reach GEO (Geostationary Orbit) or further; therefore, the rocket engine needs a significant amount of fuel to be able to fly until its final destination. These large tanks require seals that are equally large in size  typically between 1 and 2 meters or even larger.

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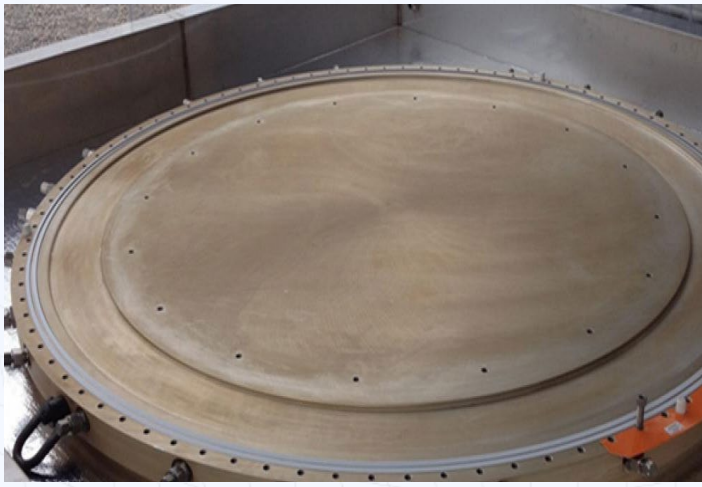
## Solution

Omniseal® RACO® spring-energized seal is a proven solution for this challenging application.

This large diameter seal has been qualified in many NASA space programs for the past 60 years, meeting the precise leakage requirement of this tank application in the range of $10^{-2}/10^{-3}$ sccs.



# Big seal, Big benefit!

## Benefits

- Available in large size
- High spring force grants excellent leakage performance even at cryogenic temperatures
- Excellent seal surface finish for cryogenic sealing
- Product cleanliness in oxygen service per IEST-STDCC1246

## Specifications

| | |
|---|---|
| Solution | • Omniseal® RACO® Spring-Energized Seal |
| Area | • Main/Upper Stage LOX/LH2 Tank Sump |
| Material | • Fluoroloy® A01 |
| Precision part | • Custom Spring-Energized, Manhole Cover Face Seal |
| Technical details | • Media: Liquid Oxygen<br>• Temperature:-253°C to +38°C (-423°F to +100°F)<br>• Motion: Static<br>• Pressure: Few hundred psi (15 to 20 bar)<br>• Counter face: 2195 Aluminium Alloy |

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# 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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