Forward in Space

Castrol® Braycote® and Brayco® lubricants

Failure is not an option

Find out more

Castrol®

Proven in Space for over 60 years

We created a propellant and oxidizer-compatible high-temperature grease for the Apollo flights in the 1960s.

From the Mars Rovers and the Space Shuttle program, to the International Space Station and the Hubble Telescope, Castrol has helped keep advanced space technologies moving forward for over 60 years.

In extreme conditions where failure is not an option, our space-grade lubricants have proven themselves time and time again – and we're not stopping any time soon.

These are exciting times for space exploration. In the growing lunar economy, we're proud to be collaborating with the brightest minds, breaking new ground. Applying decades of expertise in space-grade lubricants, we're continuing to deploy our products across a range of upcoming missions.

On both current and historic projects the **Castrol® Braycote®** and **Brayco®** ranges deliver ultimate performance in vacuum environments.

Astronaut Edwin Aldrin stands beside the lunar module
(Credit - NASA/JPL-Caltech)

Making the space grade

In the most extreme environments, from the seabed to the surface of Mars, you need oils and greases with exceptional stability.

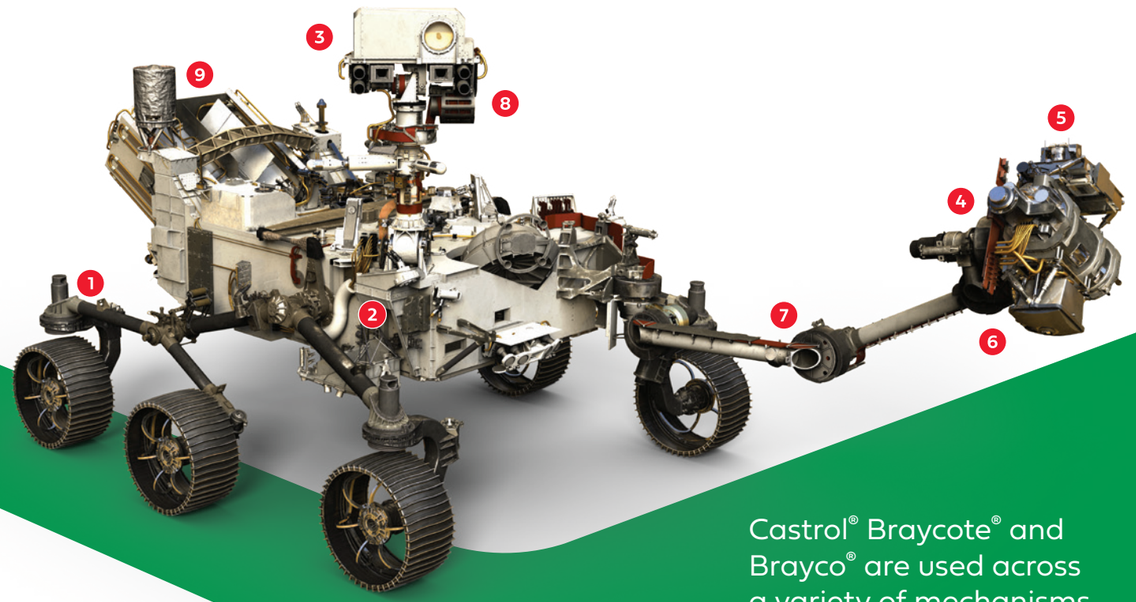
Castrol's Braycote® greases and Brayco®oils are proven to perform in extreme environments, increasing the lifespan and delivering reliable performance in critical mechanisms.

The effectiveness of our products is due to the uniqueness of their formulation, and in particular, Perfluoropolyether (PFPE).

Castrol PFPE lubricants are LOX/GOX compatible, exhibit a strong resistance to most chemicals, acids and bases and are not soluble in jet fuel and rocket propellant applications.

Recognizing that a special solvent was required to effectively clean our PFPE lubricants, Castrol developed the Castrol Brayco® IC X-100 solvent.

Our oils and greases have long been the go-to products in space exploration due to their low outgassing and volatility and wide temperature range in a vacuum environment.



NASA's Perseverance Rover
(Credit - NASA)

Castrol® Braycote® and Brayco® are used across a variety of mechanisms on the Perseverance Rover.

NASA's Ingenuity Mars Helicopter
(Credit - NASA)

Castrol on Mars

Podcast series

Discover the extreme working conditions of the Perseverance Rover on Mars and meet some people and their machines who perform under similarly extreme conditions on land, sea and air here on earth.

Listen now

1. Wheel Drive Actuators

The wheels of Perseverance are lined with raised treads specially designed for the Martian desert. It has twice as many treads as Curiosity's, making it even better equipped to deal with the unforgiving terrain.

2. MOXIE

The Mars Oxygen In-Situ Resource Utilization Experiment is key for future Mars exploration, showcasing the potential to turn its carbon dioxide atmosphere into breathable oxygen.

3. SuperCam

This compact device, no larger than a cereal box, houses a laser capable of vaporizing rock at 10,000°C. A specialized camera then analyzes the chemical composition of the resulting plasma.

4. SHERLOC

Utilizes spectrometers, cameras, and ultraviolet laser light to identify organic chemicals, similar to forensic investigators.

5. WATSON

As well as taking close-ups of the surface texture of Mars this full-color camera can be moved by Perseverance's robotic arm to provide images of the rover's instruments and parts.

6. PIXL

PIXL e Planetary Instrument for X-ray Lithochemistry has a tool called an X-ray spectrometer, which identifies chemical elements at a tiny scale.

7. Robotic Arm

Measuring 7 feet long, the robotic arm is equipped with a rotating turret containing science instruments a camera and a rock drill. The drill is powerful and precise enough to cut intact rock cores.

8. Mastcam Z

Perseverance's mast-mounted camera system captures 3-D images and video. It's powerful enough to photograph a house fly from over 100m away.

9. Caching System

Perseverance is the first rover to bring a sample caching system to Mars that will package promising samples of rock and dust.

Powered descent for
Perseverance Rover
(Credit - NASA/JPL-Caltech)

Castrol® Braycote®
Enhancing mechanism function in a vacuum environment

When critical mechanisms must operate in extreme environments, wide range of temperatures and exposure to harsh chemicals, Castrol Braycote® is there.

Its unique formulations provide a high level of resistance even in the presence of rocket fuels and vacuum. Castrol Braycote® is the reliable, high-performance choice for aerospace mechanisms.

Castrol specialty greases

Product	NLGI grade	Temperature range	Evaporation WT loss % / 22 hrs, 204°C	Base oil vapor pressure	
				@20°C	@100°C
Castrol® Braycote® 600 EF*	2	-80°C to 204°C (-112°F to 400°F)	0.26	$4x10^{-13}$	$2x10^{-9}$
Castrol® Braycote® 601 EF*	2	-80°C to 204°C (-112°F to 400°F)	0.87	$4x10^{-13}$	$2x10^{-9}$
Castrol® Braycote® 602 EF	2	-80°C to 204°C (-112°F to 400°F)	0.22	$4x10^{-13}$	$2x10^{-9}$
Castrol® Braycote® Micronic 700	2	-80°C to 204°C (-112°F to 400°F)	0.14	$4x10^{-13}$	$2x10^{-9}$
Castrol® Braycote® Micronic 1613	2	-72°C to 204°C (-100°F to 400°F)	0.18	$4x10^{-13}$	$2x10^{-9}$
Castrol® Braycote® 296	2	-50°C to 204°C (-58°F to 400°F)	0.14	$5x10^{-13}$**	$3.5x10^{-10}$**

Castrol specialty military specification greases

Product	NLGI grade	Temperature range	Evaporation WT loss % / 22 hrs, 204°C	Military specification certification
Castrol® Braycote® 804	1	-54°C to 149°C (-65°F to 300°F)	10.0 @ 149°C	MIL-PRF-27617F, Type I
Castrol® Braycote® 806	2	-30°C to +204°C (-22°F to +400°F)	1.60	MIL-PRF-27617F, Type III

*Also available in Micronic version
**For whole grease (çextrapolated)

Castrol® Brayco®
Out-of-this-world performance

With its unique low-volatility Perfluoropolyether (PFPE) lubricants, Castrol Brayco® range increases the lifespan of crucial mechanisms. It delivers reliable performance in a multitude of space applications.

Castrol Brayco® 815 Z oil is the standard for low-outgassing, low-temperature lubricants. It combines a pour point below -70°C,

ASTM E595 outgassing results of <1.0% Total Mass Loss and <0.01% Collectible Volatile Condensable Materials at 125°C and 10-5 torr vacuum.

As a stand-alone product or as the base oil in one of our many PFPE greases, Brayco® 815 Z has been successfully used in many manned and unmanned missions in Earth orbit, as well as missions to the Moon and to Mars.

Castrol specialty oils

Product	Kinematic viscosity cSt			Evaporation WT loss %	Vapor pressure	
	100°C	40°C	-40°C		@20°C	@100°C
Castrol® Brayco® 815Z*	45 (99°C)	148 (38°)	6,500	0.26	$4x10^{-13}$	$2x10^{-9}$

Castrol specialty cleaners and solvents

Product	Description
Brayco® IC X-100	Designed for use in grease plating perfluorinated lubricants and other halogenated lubricants. Compatible with most metals, plastics and elastomers.

Our collaborative approach to Space: **we call it Castronomy™**

In space, failure is not an option.

Successful missions depend on collaboration. The coming together of visionaries and high-precision technology.

Castrol's space-grade lubricants deliver 'mission critical' performance in a variety of space mechanisms and keep advanced technologies moving forward in space.

2021

Perseverance Rover

After travelling over 250 million miles, NASA's Perseverance Rover landed on Mars. Castrol products provide lubrication to a number of mechanisms including a weather station, UV spectrometer and laser micro imager.

2012

Curiosity Rover

This car-sized Rover was designed to explore the red planet's Gale crater as part of NASA's Mars Science Laboratory mission.

Even though it landed over 10 years ago, the mission still remains active.

2007

ISS repair

Shortly after installation, the Starboard Solar Array Rotary Joint (SARJ) became hard to rotate and had to be shut down. An investigation identified inadequate lubrication as part of the problem. A successful recovery plan was implemented including the application of Castrol Braycote®.

2004

Opportunity Rover

Opportunity Rover landed on the other side of Mars - on the flat plains of Meridiani Planum. It was the first Rover to identify and characterise sedimentary rocks on a planet other than Earth.

1981

Canadarm

Our lubricants enable the moving parts and appendages of the Canadarm – a series of robotic arms used since the Space Shuttle program, and today on the International Space Station.

1960s

Apollo missions

We created a propellant and oxidizer-compatible high-temperature grease for the Apollo missions in the 1960s.

BP Lubricants USA Inc.
1500 Valley Road
Wayne, NJ 07470
Telephone: 888-CASTROL
www.castrol.com/industrial-us

Castrol®