

# LUBRICANTS IN SPACE

Lubricants for aerospace applications are designed for extreme conditions where long life is critical for the success of the mission.







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Lubricants for aerospace applications have been formulated at Nye for over 65 years. Below is a demonstration of Nye's space heritage, including some examples of lubricants designed specifically for applications that must survive the severe conditions of the space environment.

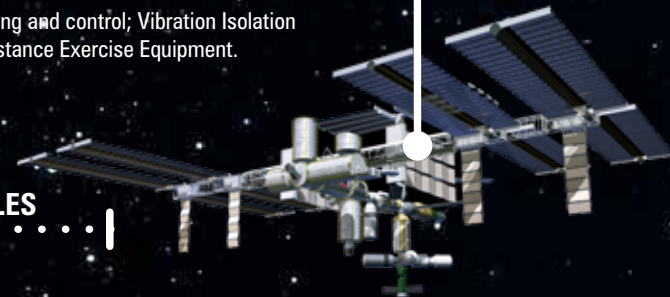


## International Space Station (ISS)

**Devices:** Multiple Mechanisms

**Nye Products:** Various products including Rheolube® 2000  
Multiple devices for positioning and control; Vibration Isolation Systems for Advanced Resistance Exercise Equipment.

250 MILES



## MetOp-SG A & B

*(Launching in 2021 & 2022)*

**Devices:** Multiple Instruments

**Nye Product:** Synthetic Oil 2001A

This partnership between ESA and EUMETSAT is developing the next generation of weather satellites.

516 MILES



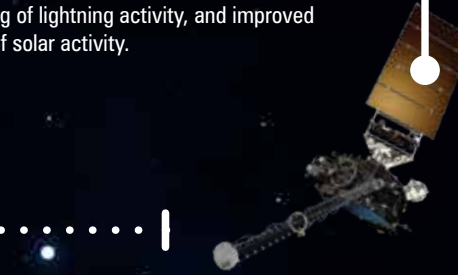
## GOES-R Series

**Devices:** Reaction Wheels & Solar Array Drives

**Nye Products:** Synthetic Oil 2001-3PB and Rheolube® 2000 & 2004

This joint effort between NASA and the NOAA aims to provide more accurate forecasts, real-time mapping of lightning activity, and improved monitoring of solar activity.

22,300 MILES



34 - 249,000,000 MILES

## Mars Rover Curiosity

**Device:** Mast Camera

**Nye Product:** NyeBar® Barrier Film

Mars Rover Curiosity has provided photos along with data concerning climate and geology since August 2012.

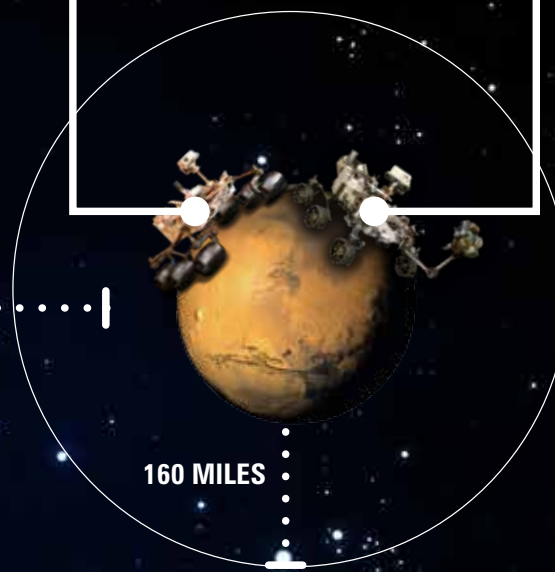
## Mars 2020 Rover

*(Launching in 2020)*

**Device:** Precision Bearings

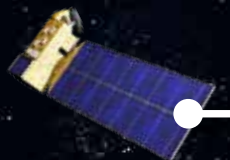
**Nye Products:** Pennzane™ Formulations

The Mars 2020 rover mission will provide opportunities to gather knowledge that addresses the challenges of future human expedition to Mars.



160 MILES

438 MILES



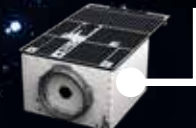
## Thermal Infrared Sensor (TIRS)

**Device:** Angular Contact Bearings

**Nye Products:** Rheolube® 2000 & Synthetic Oil 2001

The Thermal Infrared Sensor located on the Landsat Data Continuity Mission (LDCM) measures land surface temperature.

405 MILES



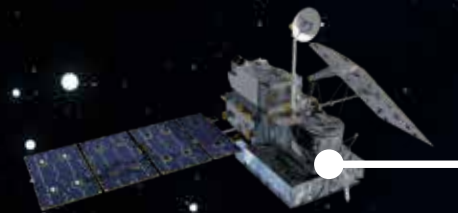
## EnMap

**Device:** Shutter Calibration Mechanism Gear

**Nye Product:** Rheolube® 2000

This German hyperspectral satellite mission aims to monitor and characterize the Earth's environment on a global scale.

253 MILES



## Global Precipitation Measurement (GPM)

**Device:** Harmonic Drive Gear

**Nye Products:** Rheolube® 2004 & Synthetic Oil 2001-3PB

Global Precipitation Measurement is a joint mission between JAXA and NASA that records precipitation characteristics on Earth.

1,000,000 MILES



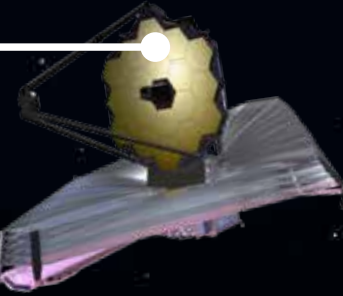
## CubeSats/NanoSats

**Device:** Reaction Wheels

**Nye Products:** Pennzane™ Formulations & NyeBar® Barrier Film

The reaction wheels located on CubeSats/NanoSats provide an efficient, high-performance solution for attitude control.

55 - 217 MILES



## James Webb Space Telescope (JWST)

*(Launching in 2020)*

**Devices:** Multiple Mechanisms

**Nye Product:** Custom Pennzane™ Oil Formulation

The James Webb Space Telescope will be a large infrared telescope with a 6.5 meter primary mirror. The telescope will be launched on an Ariane 5 rocket from French Guiana.

## Mars Climate Sounder (MCS)

**Device:** Actuator

**Nye Product:** Synthetic Oil 2001A

The Mars Climate Sounder observes the temperature, humidity, and debris content of the Martian atmosphere.



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ISO 9001:2015  
IATF 16949:2016  
ISO 14001:2015  
ISO 13485: 2016  
AS 9001D

**Pennzane**<sup>™</sup>  
FLUIDS

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Nye Lubricants, Inc. provided lubricant products for certain components within the aforementioned devices.

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