INTELLIGENT SPACE SYSTEMS

POWERED BY WIND RIVER TECHNOLOGY

WNDRVR

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WIND RIVER AT A GLANCE

1. **Global leader in delivering software for intelligent connected systems,** offering a comprehensive, edge-to-cloud software portfolio
2. Technology and expertise that enable the **development, deployment, operations, and servicing of mission-critical intelligent systems**
3. Technology found in **more than 2 billion products**
4. **Award-winning customer support, a broad partner ecosystem**, and world-class professional services
5. Headquartered in Alameda, CA, with **~1,300 employees, including 460 in R&D and 235 in GTM**

1981
Founded

~1,300
Employees Globally

1,700+
Global Customers

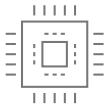
~$400M
2021 Revenue

20
Countries/Global Presence

2B+
Deployed Edge Devices

9
Consecutive Years Ranked as Top Workplace

250+
Ecosystem Partners



#1
Market Share in Edge Compute OS Platforms

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BRANDS DELIVERING THE SAFEST, MOST SECURE DEVICES IN THE WORLD TRUST WIND RIVER

AEROSPACE & DEFENSE

Airbus Group
BAE Systems
Boeing
Elbit Group
General Dynamics
GE Aerospace
Hensoldt
Honeywell
L3Harris
Leonardo
Lig Nex1
Lockheed Martin
Northrop Grumman
Mitsubishi
Raytheon Technologies
Samsung
Thales
Transdigm Group
U.S. Government

MEDICAL

Applied Biosystems
Becton Dickinson
Boston Scientific
Dentsply Sirona
Dräger Medical
Fedegari Autoclavi SpA
Fresenius
GE Healthcare
Olympus
Roche Diagnostics
Toshiba Medical
Varian

INDUSTRIAL

ABB
Belden
Bombardier
Bosch Rexroth
Emerson Electric
ExxonMobil
General Electric
KUKA
Lam Research Group
Liebherr
Mitsubishi
OSI Systems
Rockwell Automation
Samsung Electronics
Schneider Electric
Siemens
Toshiba

TELECOM

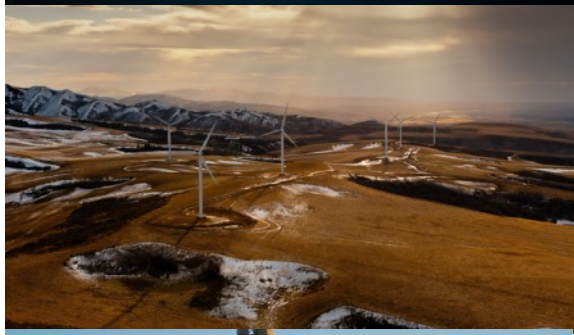
ARRIS
Avaya
Ciena
Dialogic
Ericsson
Fujitsu
Hitachi
Hypercom
Kapsch
Kyocera
Motorola
NEC
Nokia
T-Systems
Tellabs
Verizon
ZTE

AUTOMOTIVE

AWTC Europe
BMW
Bosch
Clarion
Continental
Daimler
Delphi
Fiat
Ford
Fujitsu
General Motors
Harman
HKMC
Honda
Johnson Controls
Mobis
Nissan
PSA Peugeot Citroen
Renault
Toyota
Valeo Group

MOBILE & CONSUMER

Dell
Epson
Fuji-Xerox
IBM
Konica Minolta
LG Electronics
NEC
Oki
Prima Cinema
Qualcomm
Ricoh
Samsung
Sharp
SK Telecom
Texas Instruments
Xerox

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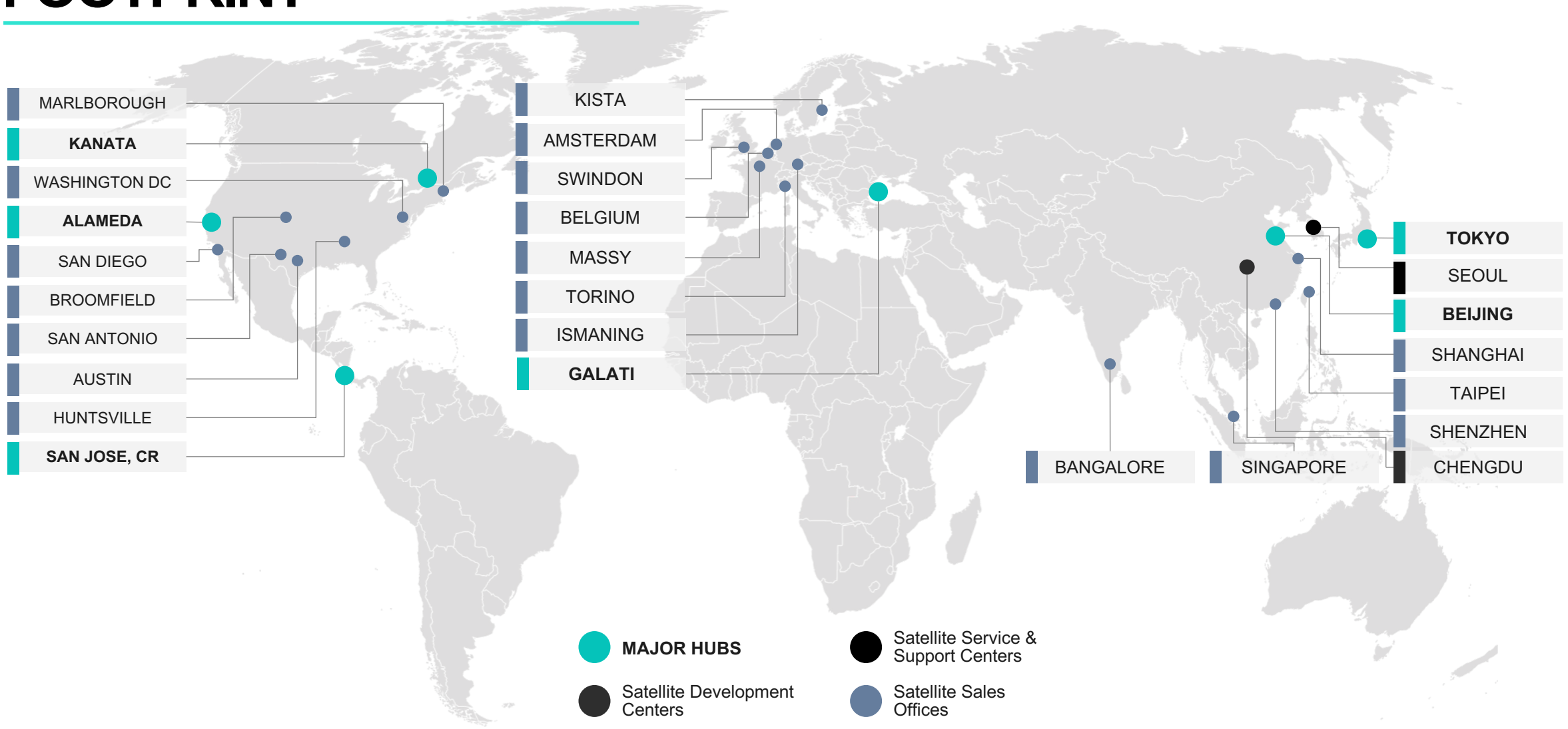
GLOBAL FOOTPRINT



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OUR MISSION

ENABLE OUR CUSTOMERS TO REALIZE THE DIGITAL FUTURE OF THE PLANET WITH SOFTWARE-DEFINED, MISSION-CRITICAL INTELLIGENT SYSTEMS WHERE SECURITY, SAFETY, AND RELIABILITY ARE PARAMOUNT

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2021 AWARDS

2022 Grand Stevie Award, American Business Award, Highest-Rated New Product of the Year

2022 Gold Stevie Award, American Business Award, Cloud Infrastructure

Award recognizes companies making remarkable progress and innovation in the cloud computing industry

Award recognizes companies who have demonstrated excellence and represent leaders in the IoT industry

Certification recognizes the delivery of top-quality service and support representing industry best practices

Certification recognizes companies as employee-validated great workplaces

INTELLIGENT SYSTEMS IN SPACE

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INTELLIGENT SYSTEMS

ESA SELECTS VXWORKS

Standard Payload Computer for International Space Station

The role of SPLC:
It logically resides between the payload and the ISS data management system, taking care of all external communication while also interfacing with the payload.

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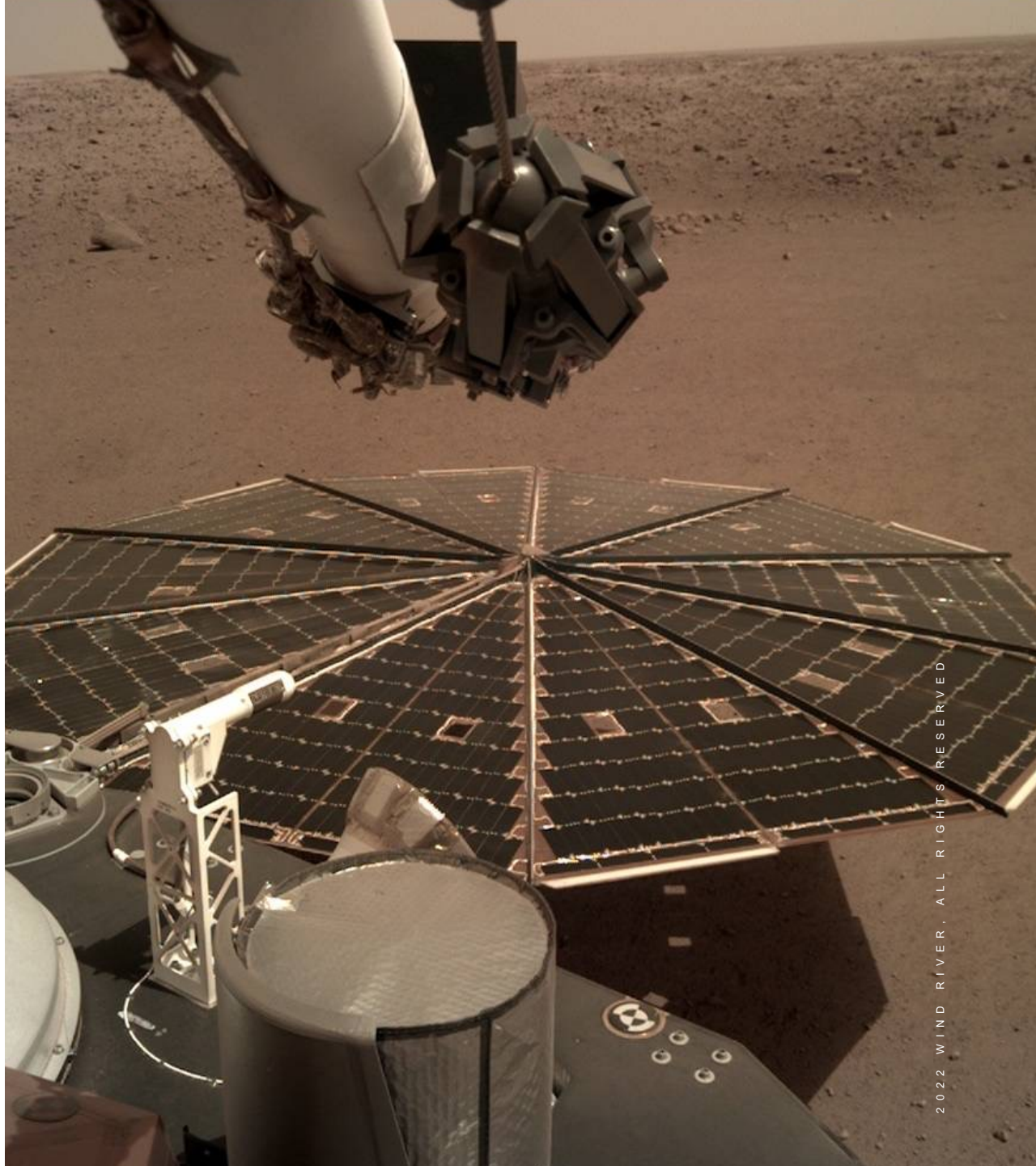
NASA SELECTS VXWORKS

Mars Insight Lander

Referred to as “the seven minutes of terror,” the entry, descent, and landing (EDL) began about 80 miles (about 128 kilometers) above the surface and ended with the lander safe and sound on Mars seven minutes later.
The atmosphere on Mars is 100 times thinner than Earth’s, so this guided entry and descent is an engineering feat. While landing, the system had to react with sub-millisecond precision, making adjustments based on real-time readings. This is where VxWorks’ determinism was mission critical.



NASA SELECTS VXWORKS

Juno Mission to Jupiter

NASA's Juno autonomous satellite used VxWorks to help get scientists closer than ever to the fifth planet from the sun. VxWorks handled the mission-critical aspects such as guidance, navigation, data transfers, engine burns, communications, and more.

Image courtesy of NASA and NASA/JPL

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INTELLIGENT SYSTEMS

ASTRANIS SPACE TECHNOLOGIES SELECTS VXWORKS

Next-Generation Satellite

"We are very excited to be working with Wind River on our first satellite. Wind River's proven success in space and its long-standing relationship with NASA and others in the space industry give us confidence that it is the right partner to bring our vision to life."

—Astranis CEO and cofounder John Gedmark

Image courtesy of NASA and NASA/JPL

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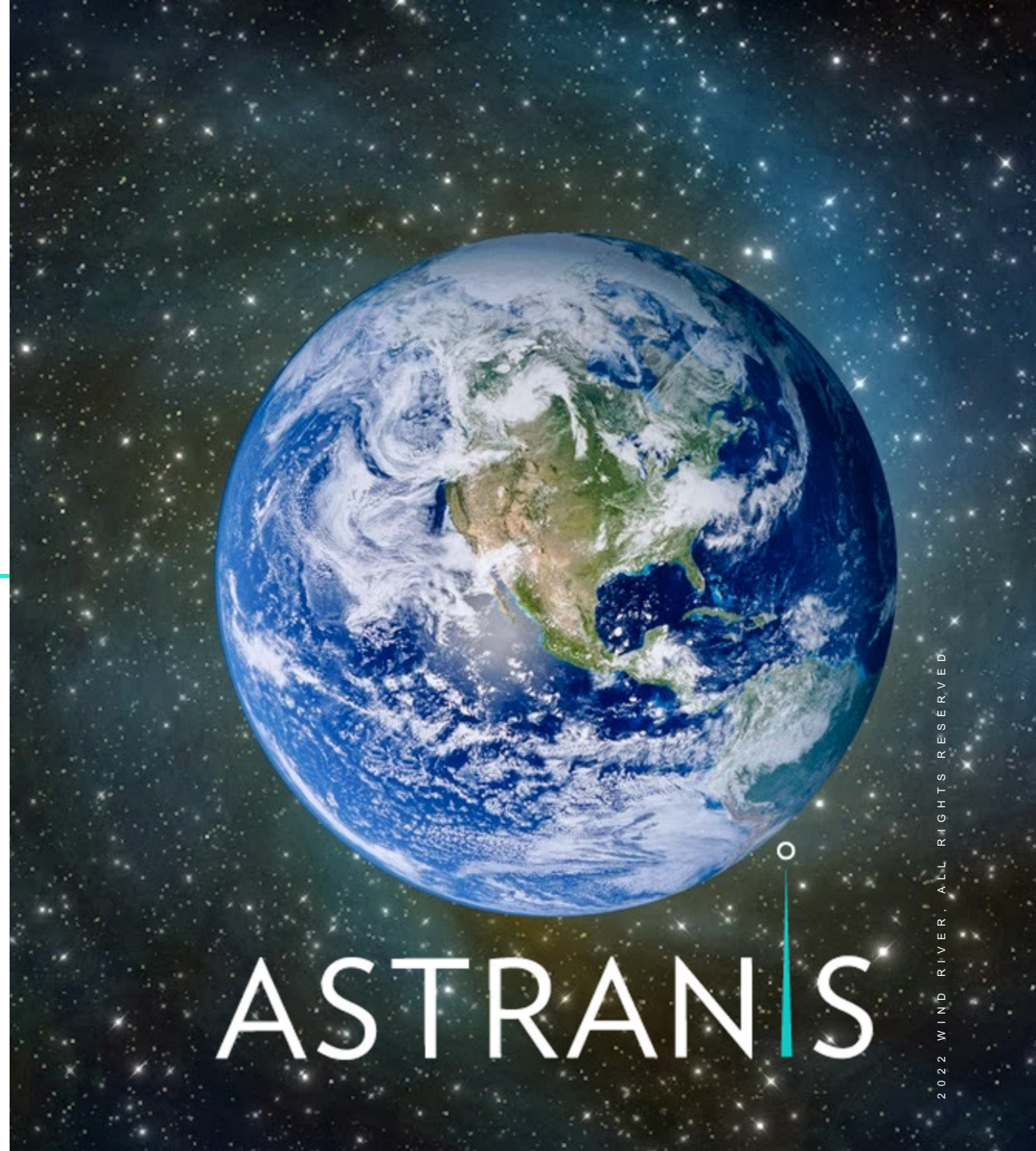

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NASA SELECTED VXWORKS

Interface Region Imaging Spectrograph (IRIS) MISSION

To observe how solar material moves, gathers energy, and heats up as it travels through the sun's lower atmosphere.

VxWorks runs the main flight computer, guiding the spacecraft to the sun.

Image courtesy of NASA and NASA/JPL

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NASA SELECTS VXWORKS

Space Shuttle Program

VxWorks was used for:

- Checkout and launch control
- MEDS cockpit upgrade
- IVHM MTD systems

Projects included partner products from:

- Radstone
- RTI
- MathWorks

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SPACEBEL SELECTS VXWORKS

Esa Proba 1 Satellite

"We chose Wind River's VxWorks operating system for PROBA because of its robustness and proven reliability on space missions."
—Spacebel

Launched October 22, 2001
Still operational 2022

Image courtesy of ESA

NASA SELECTS VXWORKS

Flight and Mission Computers on Mars Odyssey

VxWorks handled all telemetry and communications with Earth. Telemetry includes course corrections, flight monitoring, health and status monitoring, housekeeping functions — pretty much everything.
Odyssey handles data communications from the Mars Exploration rovers back to Earth.

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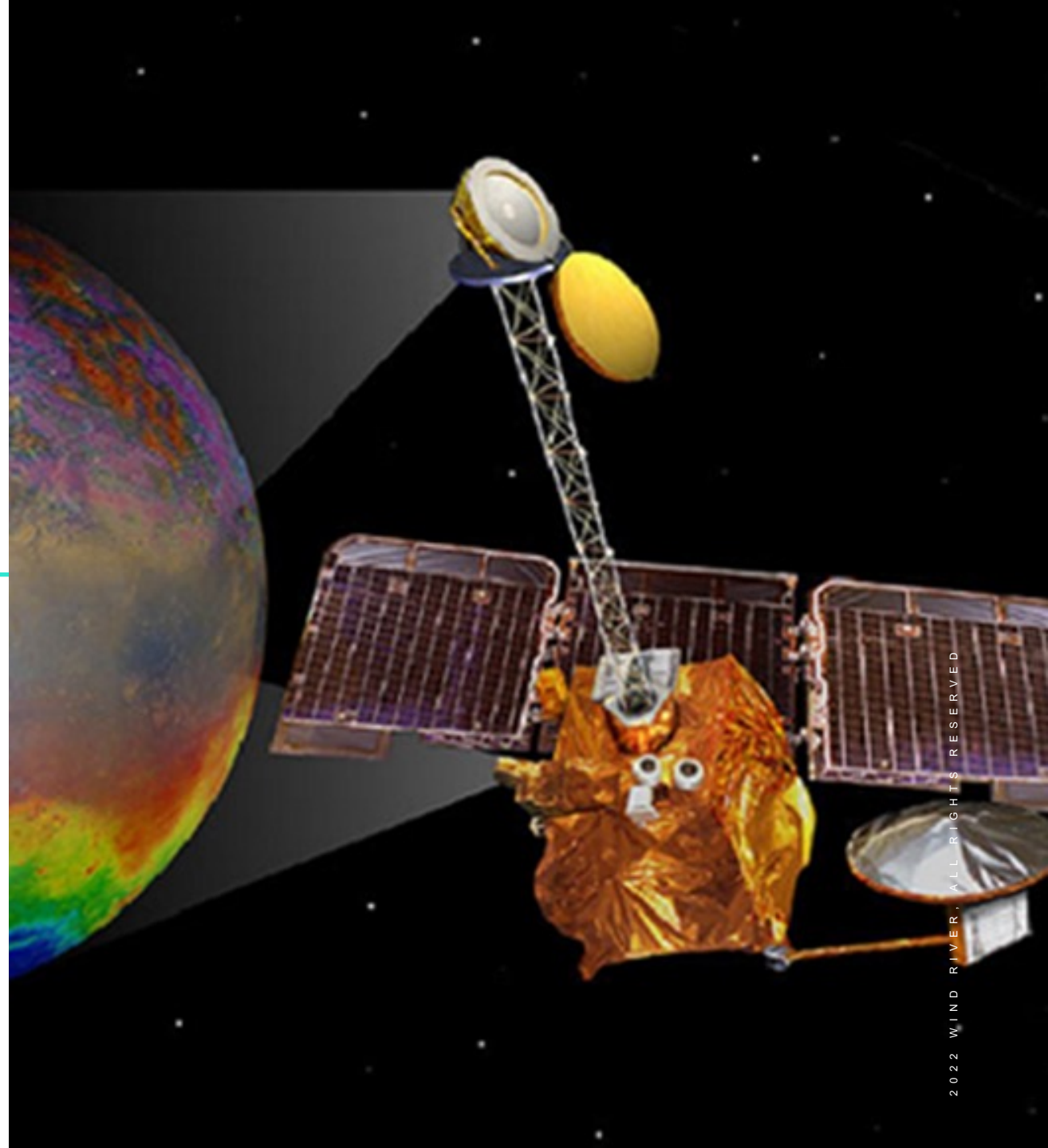

CIRA SELECTS VXWORKS

Flight Computer on the FTB-1

"The combination of [VxWorks' flexibility, scalability, robustness, performance, and compatibility] has proven to be decisive in the creation of a control solution capable of responding to the application's critical requirements."
—CIRA

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NASA SELECTS VXWORKS

James Webb Space Telescope

Wind River is proud of VxWorks' role in Webb's Integrated Science Instrument Module (ISIM), providing the OS Services layer for the ISM science payloads applications.

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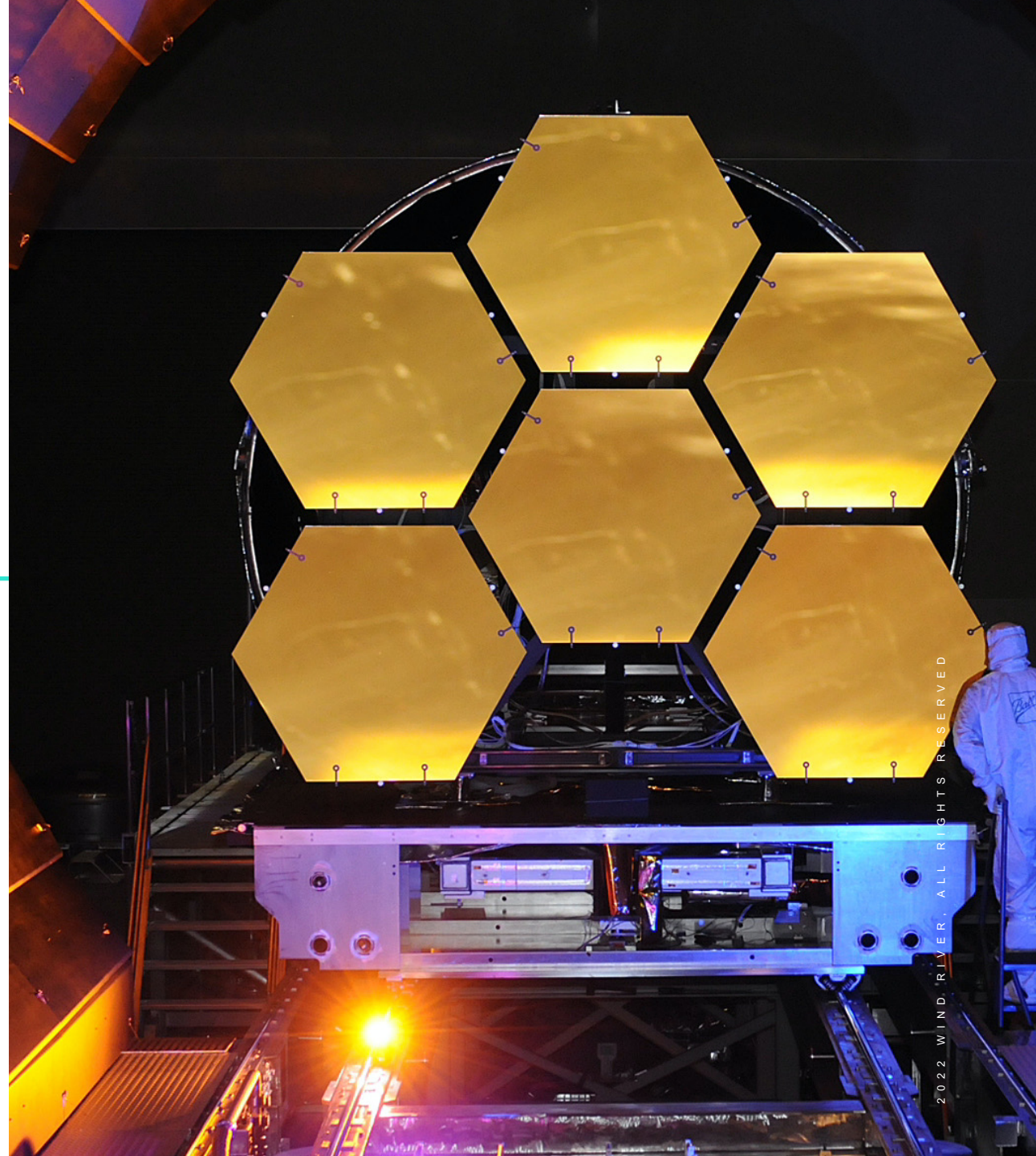

NASA SELECTS VXWORKS 653

Ares I and Ares V Launch Vehicles

VxWorks was used for:

- **Instrument unit avionics (IUA)**
- **Guidance, navigation, control**

Wind River provides NASA with the assurance that VxWorks 653 will serve the life of the system, providing the reliability necessary for mission-critical operations in space flight.

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IRIDIUM SELECTS WIND RIVER SIMICS

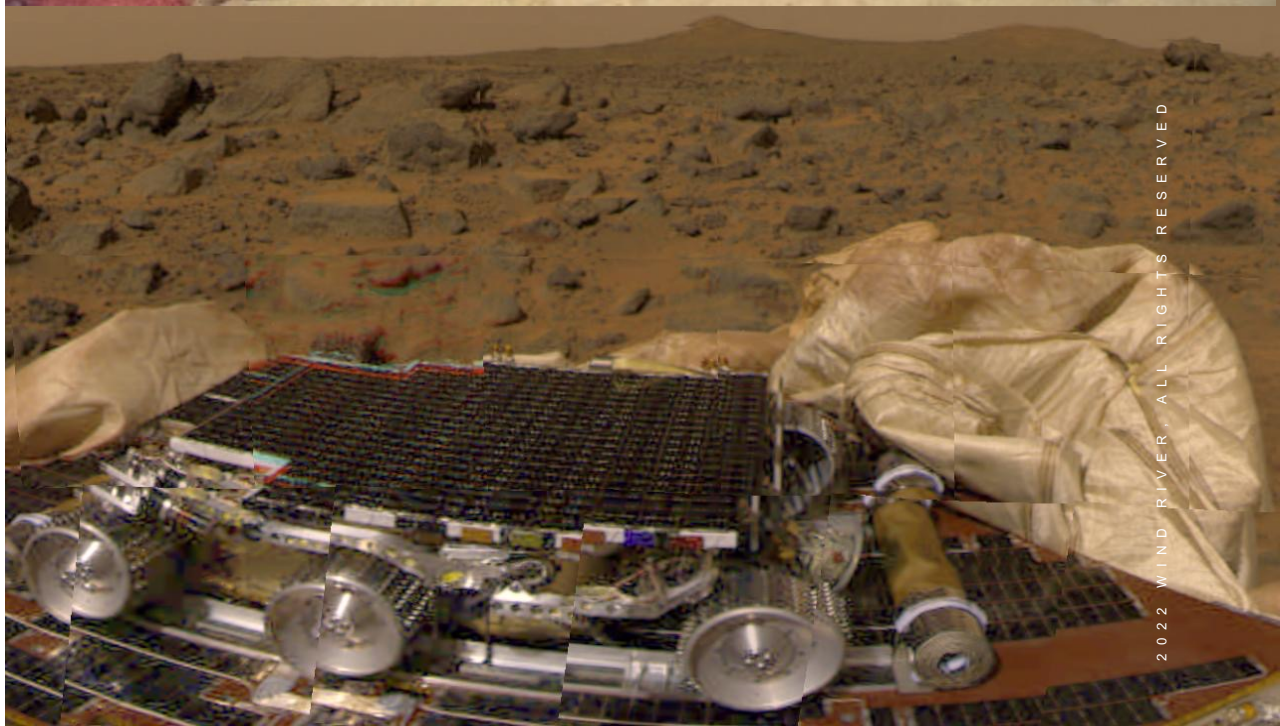
Iridium Satellite System

With Simics, Iridium was able to model hardware degradations as they occurred, and more thoroughly test software on the ground before uploading.

NASA SELECTS VXWORKS

1996–1997 Pathfinder Mission to Mars

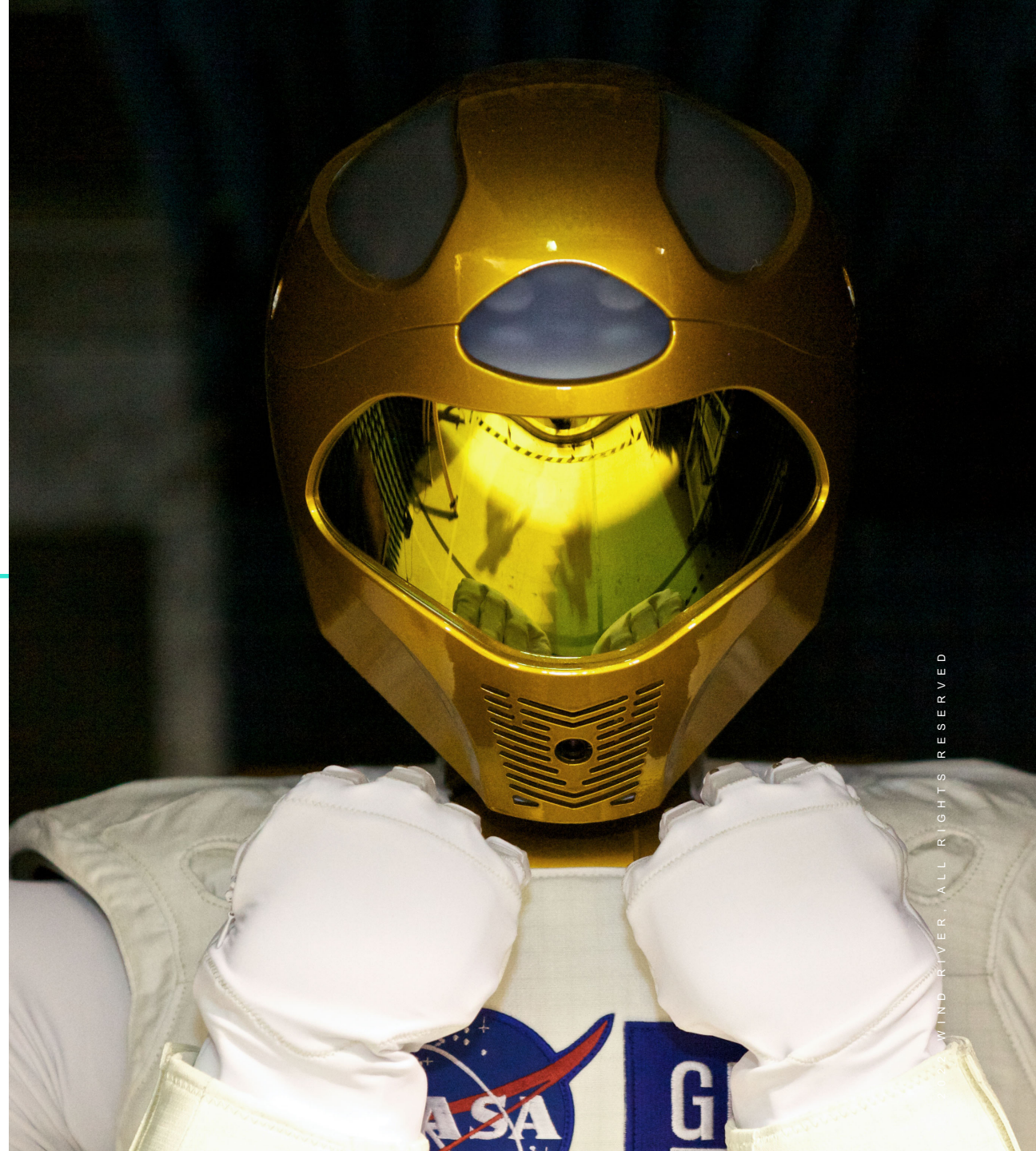
VxWorks helps NASA meet the "better, faster, cheaper" design goals of the overall space program.



NASA SELECTS VXWORKS

Robonaut Project

The processors in the Robonaut run the VxWorks real-time operating system. This combination of flexible computing hardware and operating system supports varied development activities.



EUROPEAN SOUTHERN OBSERVATORY SELECTS VXWORKS

Very Large Telescope (VLT)

Wind River software has helped the European Southern Observatory keep pace with the changes in embedded technology.

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NASA SELECTS VXWORKS

VxWorks is responsible for Genesis autonomous flight software.

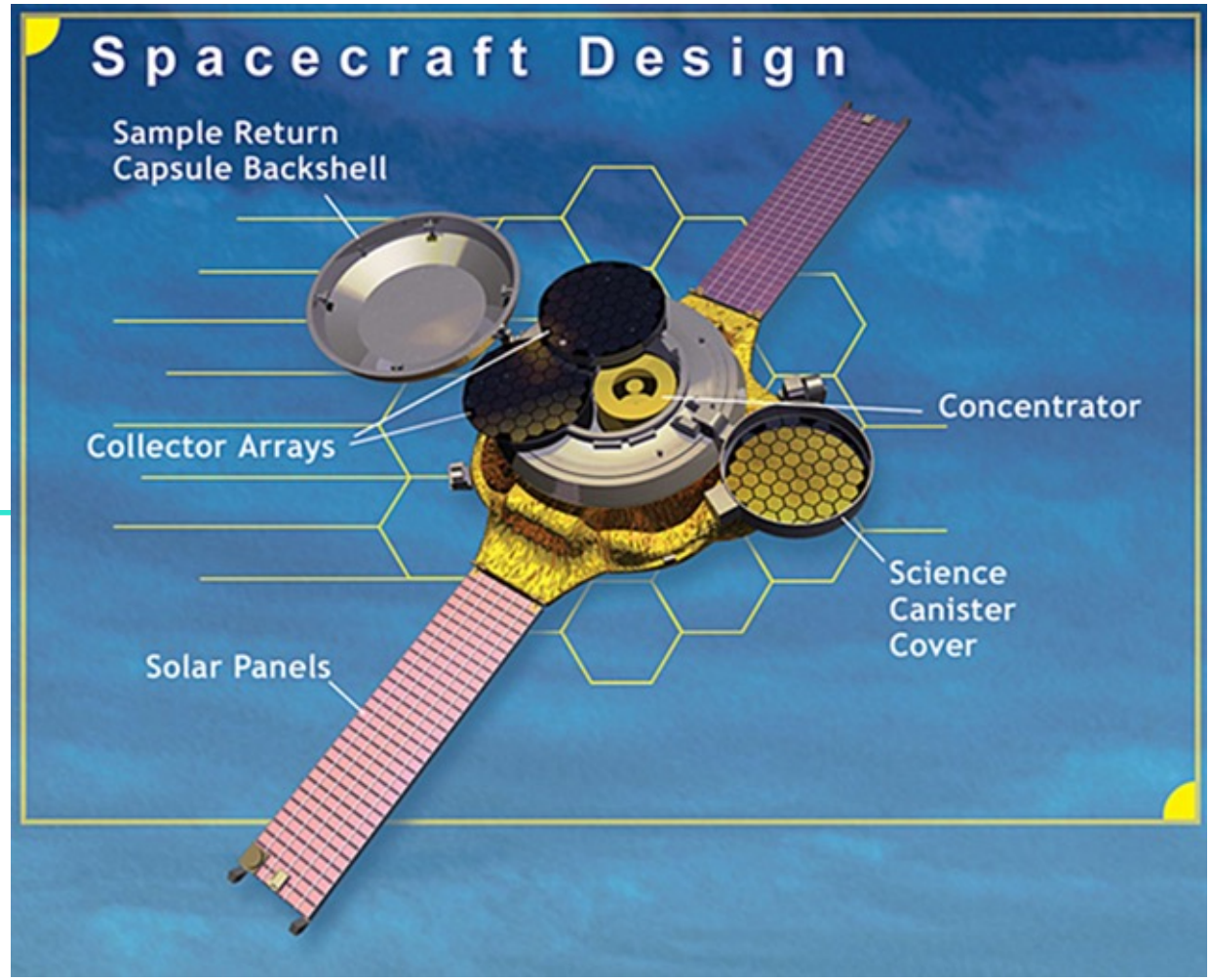

Image courtesy of NASA and NASA/JPL

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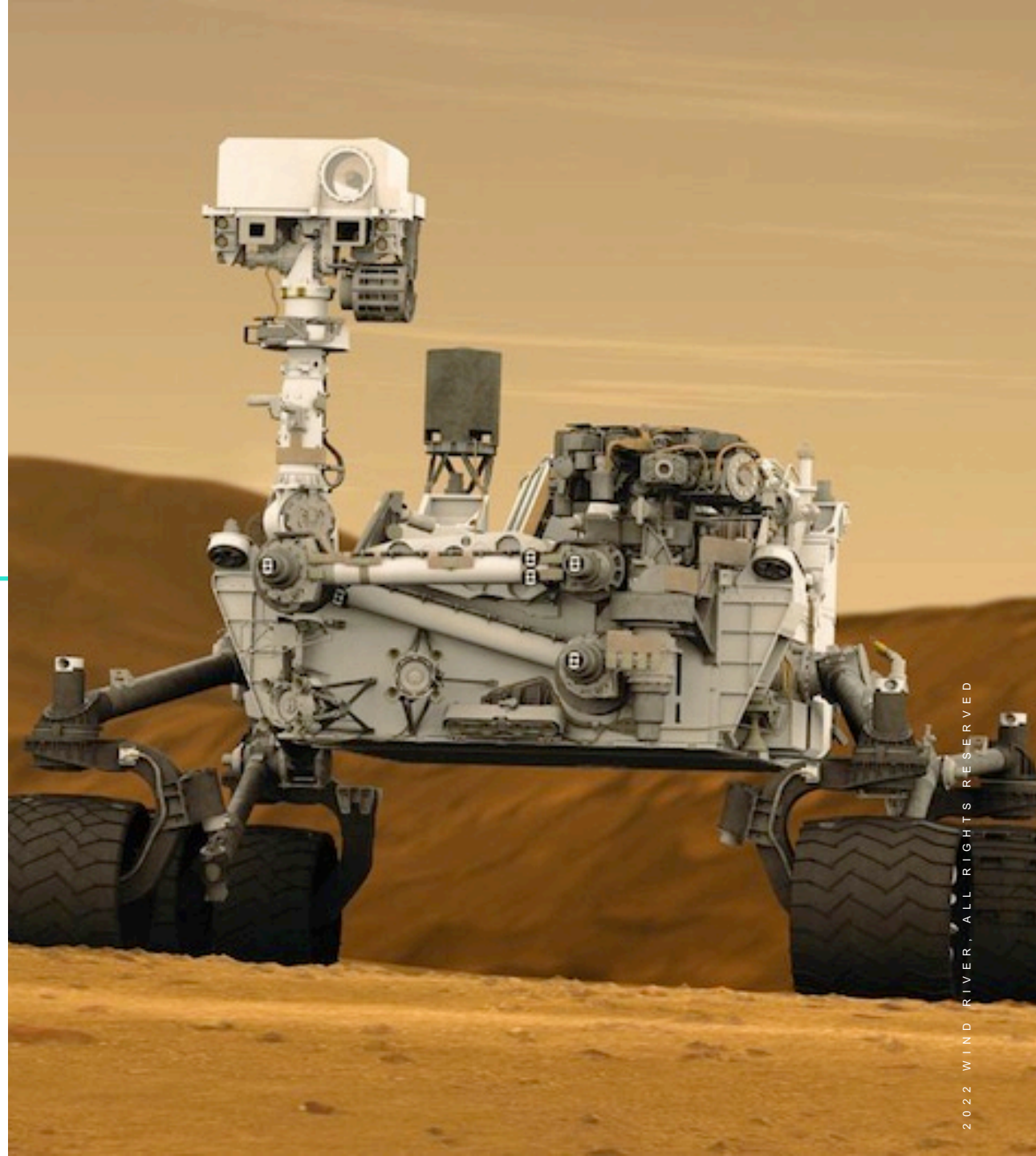
NASA SELECTS VXWORKS

Mars Curiosity Rover

VxWorks is the software platform that controls the execution of all of Curiosity's functions, from managing avionics to collecting science data and sending the experimental results back to JPL on Earth using satellite telemetry.



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GTC SELECTS VXWORKS

Control System in the Gran Telescopio Canarias (GTC)

“We chose Wind River’s VxWorks because we needed a sufficiently stable and high-performance real-time operating system.”
—GTC Project

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NASA SELECTS VXWORKS

Operating Systems in the X-38 Crew Return Vehicle

“It’s absolutely critical that the operating system perform the way we had planned it to … or we lose somebody’s life.”
—NASA

NASA SELECTS VXWORKS

Mars Phoenix Lander

“If you wanted to look at the craft as a body, and the various science stations as senses, the RAD6000 running VxWorks would be the brain.”
—Wind River

HONEYWELL SELECTS SIMICS

Orion Program

With Simics, software and systems teams are beginning work years before the target hardware is available.

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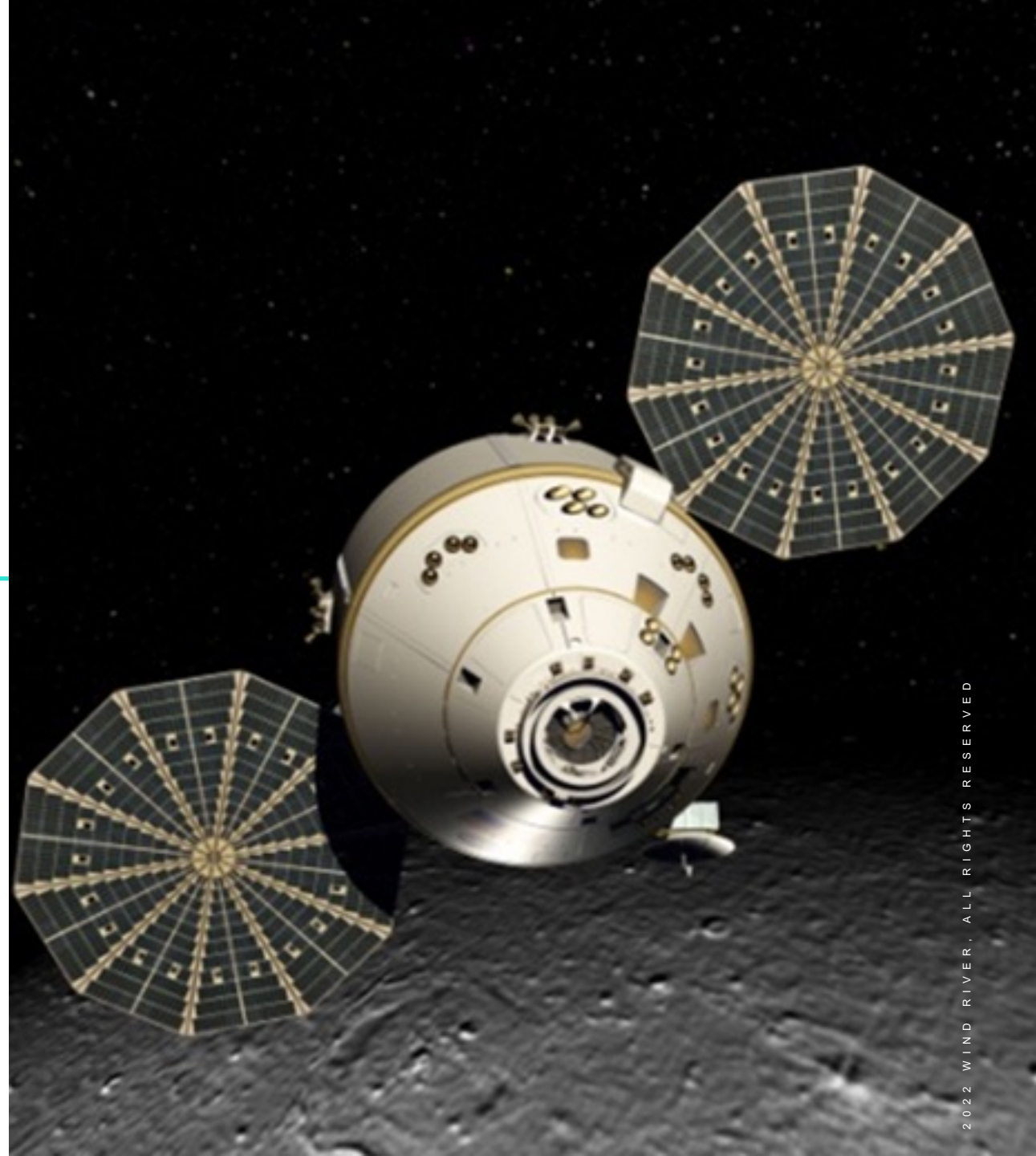

NASA JPL SELECTS VXWORKS

2005–2006 Mars Exploration Rovers

IMAGES: COURTESY NASA

← Spirit

Mission Complete
Last contact: March 22, 2010
Operational: More than 6 years

Opportunity →

Mission Complete
Last contact: June 10, 2019
Operational: Nearly 15 years

VxWorks runs on radiation-hardened processors required for space missions, including the BAE Systems rad6000 used on the rovers.

Although designed to last only 3 months, they provided valuable science for nearly 15 years.

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NASA SELECTS VXWORKS

The Global Precipitation Measurement Mission (GPM)

VxWorks is the software platform for the Command and Data Handling Subsystem (C&DHS). The C&DHS is in charge of command reception and execution, payload system operations, housekeeping operations, and spacecraft control.

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INTELLIGENT SYSTEMS

SSTL SELECTS VXWORKS

VESTA 3U Nanosatellite Technology Demonstration Mission

The 4kg satellite has 3-axis pointing capability, an SEU-tolerant on-board computer, VxWorks operating system, and also flies a commercial off-the-shelf (COTS) VHF deployable antenna system.

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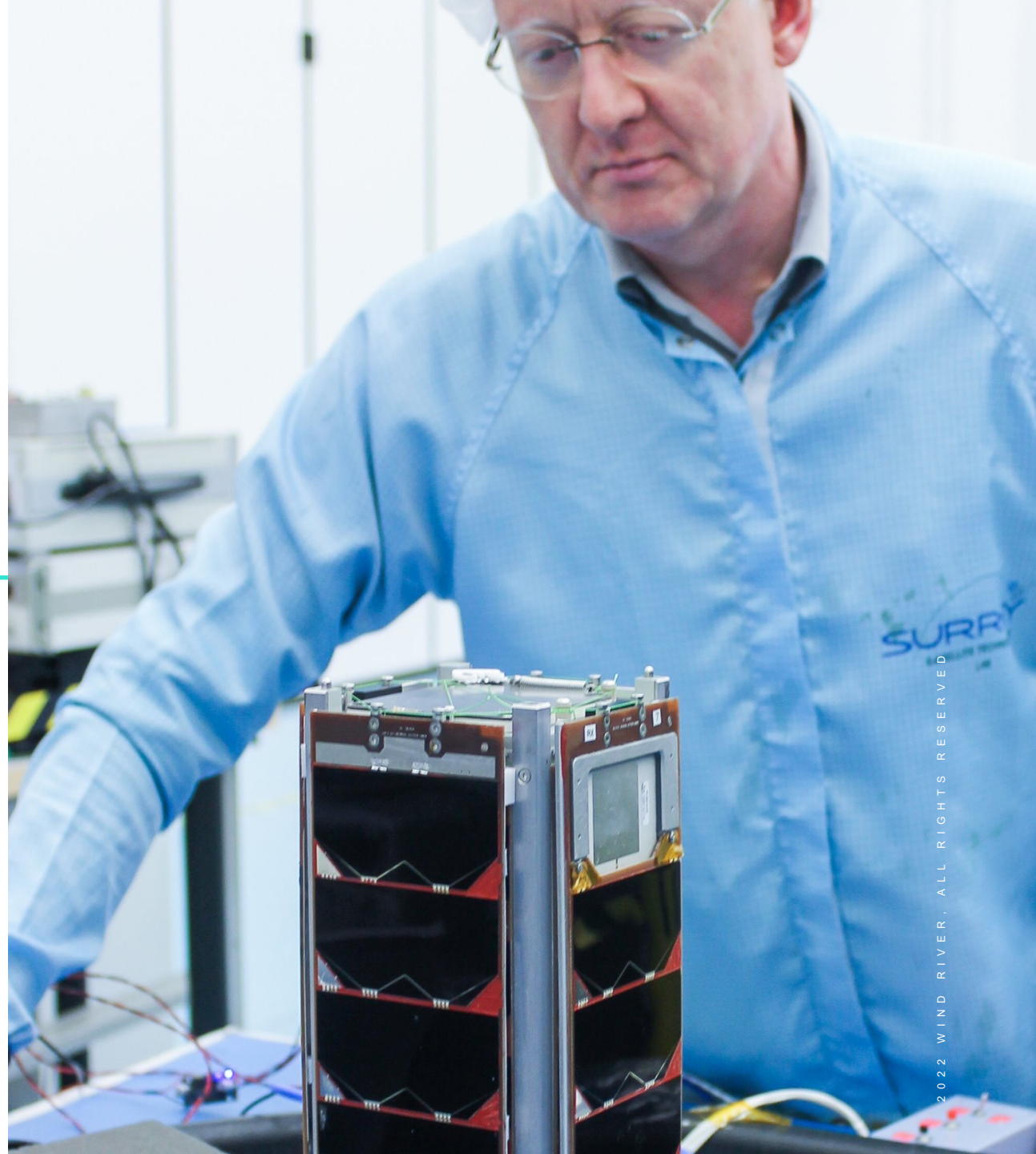

NASA SELECTS VXWORKS

MARS Perseverance Rover

Perseverance is the ultimate intelligent system. The "brains" of the rover were highly autonomous, taking photos and making image comparisons to pick the best landing site, for example.

Image courtesy of NASA and NASA/JPL

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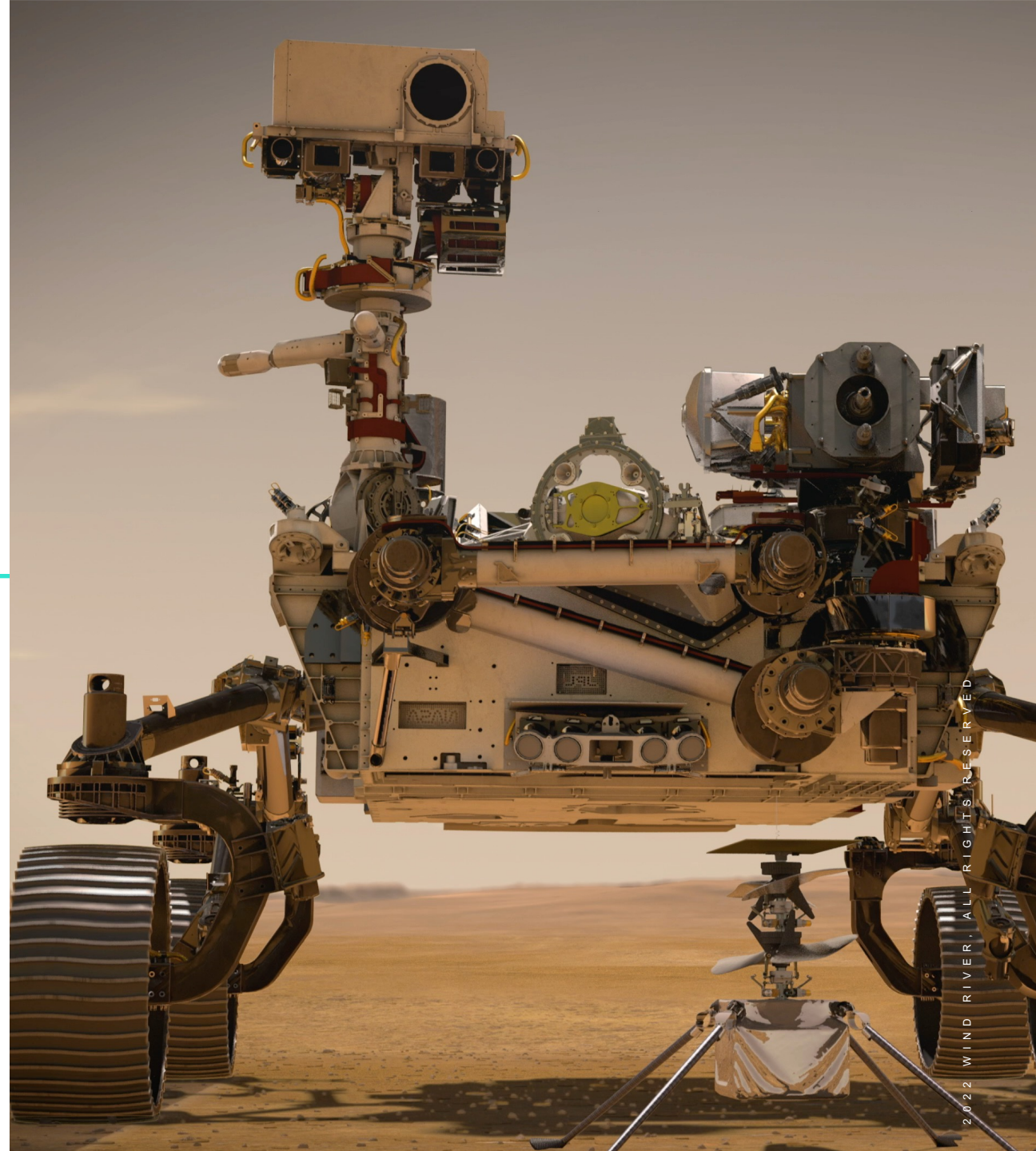

INTELLIGENT SYSTEMS

NASA SELECTS VXWORKS

Solar Dynamics Observatory

The VxWorks operating system controlled the rocket when getting SDO into its orbit, and it keeps SDO in communication. It relays data from the science packages back to Earth.

Image courtesy of NASA and NASA/JPL

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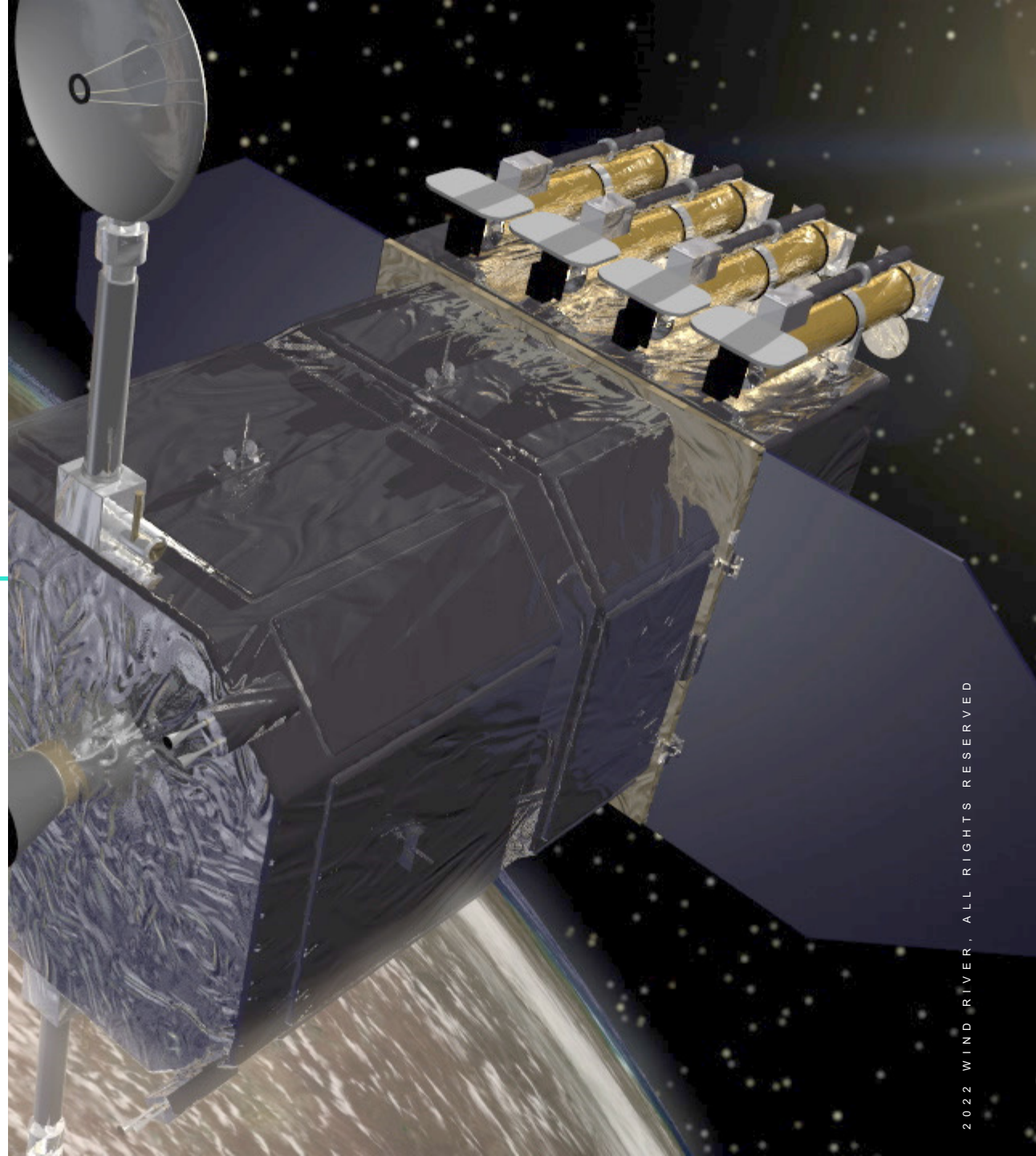

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GENERAL DYNAMICS SELECTS SIMICS

Fermi Gamma Ray Space Telescope

Wind River Simics enabled General Dynamics to create a comprehensive test platform that can easily scale across the whole project, meeting the needs of all parties involved while also providing testing capabilities beyond those of real hardware.

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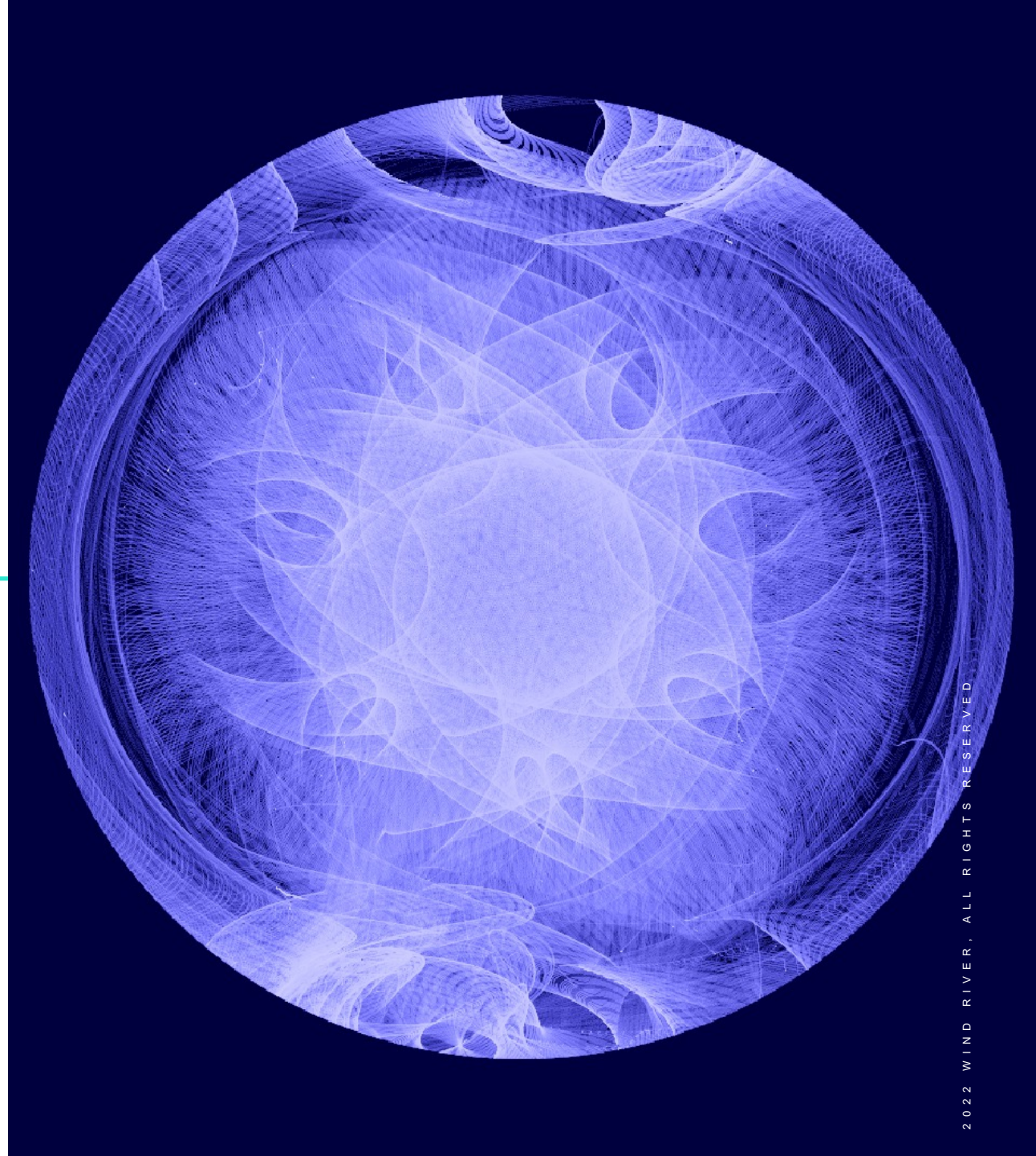

NASA SELECTS VXWORKS

Dawn Spacecraft

The command and data handling subsystem (C&DHS) is based on a RAD6000 board running VxWorks. The software is written in C. 8GB is available on the board as storage for engineering and scientific data.

Image courtesy of NASA and NASA/JPL

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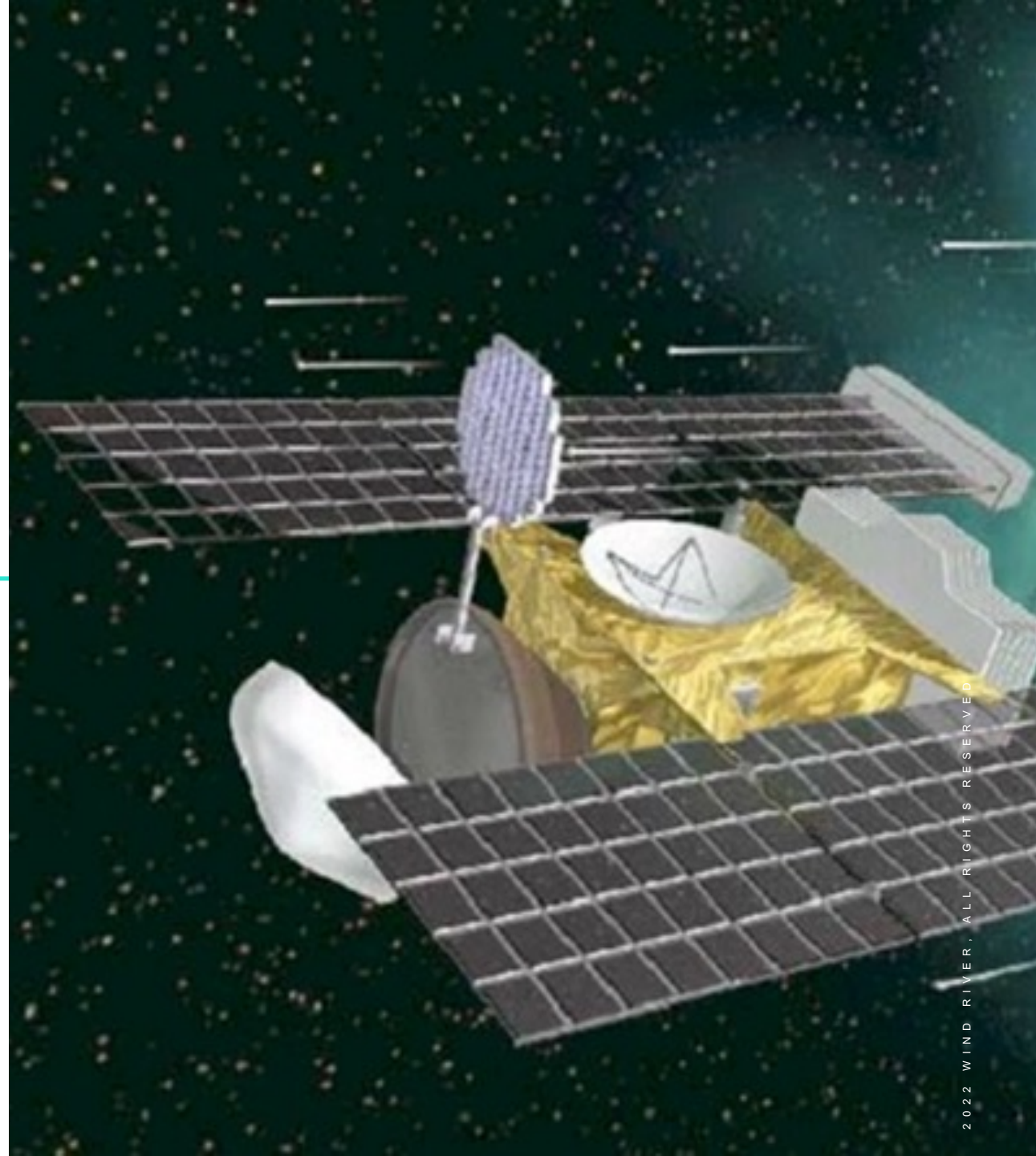
NASA SELECTS VXWORKS

Stardust: Comet and Interstellar Dust Return Mission

VxWorks is responsible for Stardust's flight trajectory and path, the collection of interstellar dust and cometary material, the journey back to Earth, and the safe landing of the return capsule.

Image courtesy of NASA and NASA/JPL



SPACEX SELECTS VXWORKS

Flight Computer in the Falcon 9 Launch Vehicle

Falcon 9 is a two-stage liquid oxygen and rocket-grade kerosene (RP-1)–powered launch vehicle. VxWorks will run in the capsule to control launch functions and remotely manage rocket operation.

NASA SELECTS VXWORKS

Flight and Mission Computers on Deep Impact

VxWorks handled all telemetry and communications with Earth. Telemetry includes course corrections, flight monitoring, health and status monitoring, housekeeping functions — just about everything necessary to get the probes there, on target.

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NASA SELECTS VXWORKS

Van Allen Probes

Powered by VxWorks, the instruments on the Van Allen Probes provide measurements that have been used to validate theories about plasma physics, and they have revealed new features and structures in the belts.

Image courtesy of NASA and NASA/JPL

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LOGICA SELECTS VXWORKS

Integrity Processing Facility (IPF)

The European Geostationary Navigation Overlay Service (EGNOS) IPF has completed safety certification to EUROCAE ED-12B Level B running on Intel® architecture, which was an important milestone in enabling EGNOS to be used for safety-critical applications.

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NASA SELECTS VXWORKS

Lunar Atmosphere Dust and Environment Explorer (LADEE)

VxWorks was the operating system that controlled the rocket motors, managed course corrections to keep LADEE's orbit correct, and enabled the spacecraft to return data from the onboard science instruments to Earth.

At the end of the mission, the system ensured that the spacecraft successfully crashed into the far side of the moon, avoiding all historic lunar landing sites.

Image courtesy of NASA and NASA/JPL

NASA SELECTS VXWORKS

OSIRIS-REx Mission

The flight software receives commands and control "packages" and uses the VxWorks RTOS to receive this important telemetry in real time. This includes a degree of autonomous operation including maneuvering and controlling the Touch-and-Go sample acquisition process.

Image courtesy of NASA and NASA/JPL

INTELLIGENT SYSTEMS

ORBITAL SCIENCES CORPORATION SELECTED VXWORKS

Cygnus Cargo Spacecraft for ISS

As part of NASA's Commercial Orbital Transportation Services program, VxWorks runs the main flight computer that controls the avionics in guiding the craft to the International Space Station (ISS).

Image courtesy of NASA and NASA/JPL

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INTELLIGENT SYSTEMS

NASA SELECTS VXWORKS

Lunar Reconnaissance Orbiter (LRO)

VxWorks powers the flight computer running on BAE RAD750 that is housed within the high-performance, modular, and state-of-the-art Command and Data Handling (C&DH) system.

Image courtesy of NASA's Goddard Space Flight Center Conceptual Image Lab

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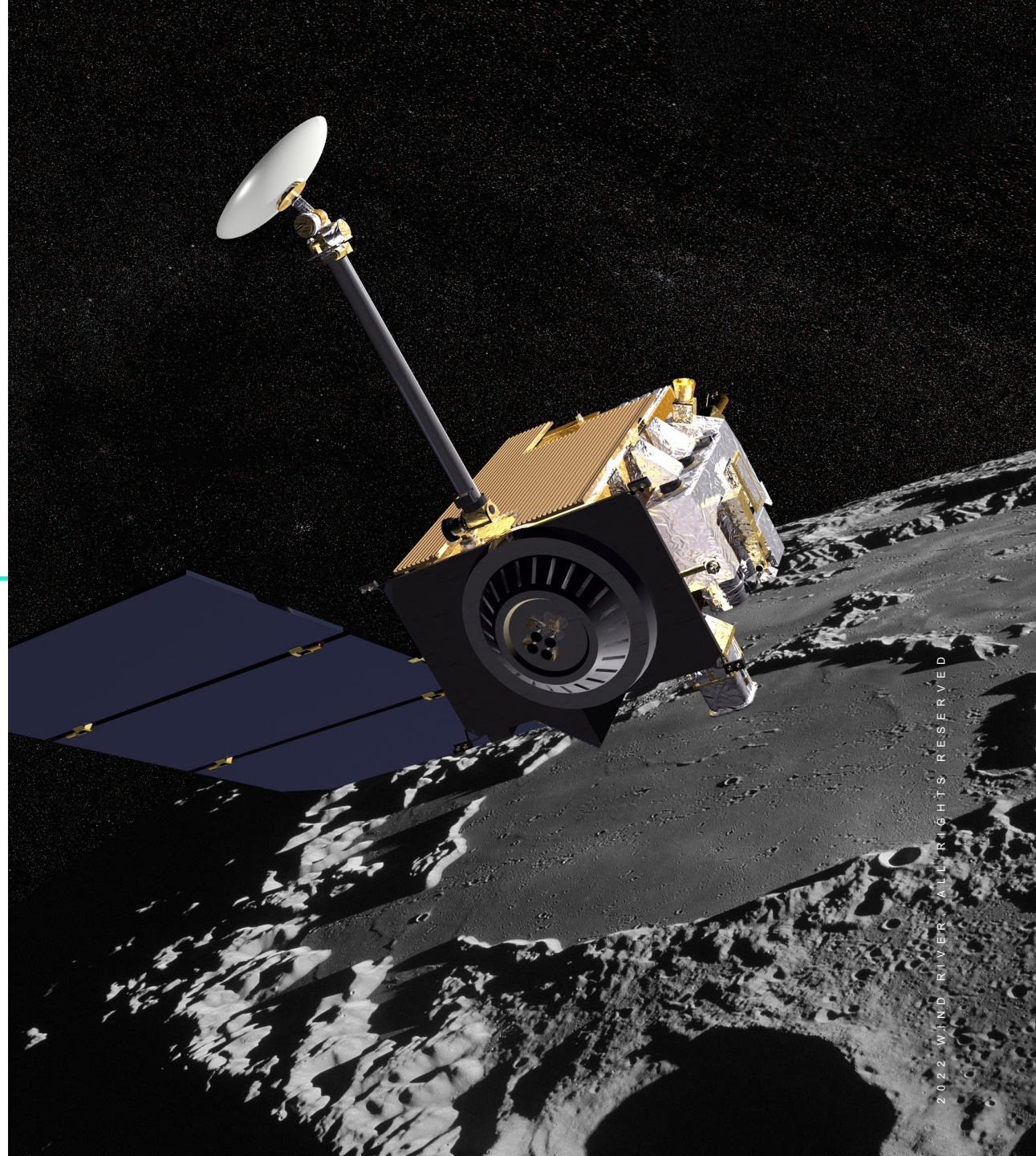

NASA SELECTS VXWORKS

Kepler Space Telescope

VxWorks runs the main flight computer, controlling various avionics packages to keep the craft pointing at the right part of the sky and returning images from the array of camera chips on the craft.

It is critical that this craft remain pointed in the right direction to detect when planets cross in front of stars, which is how we detect which stars have planets, what kind of orbit the planets have, and how large they are.

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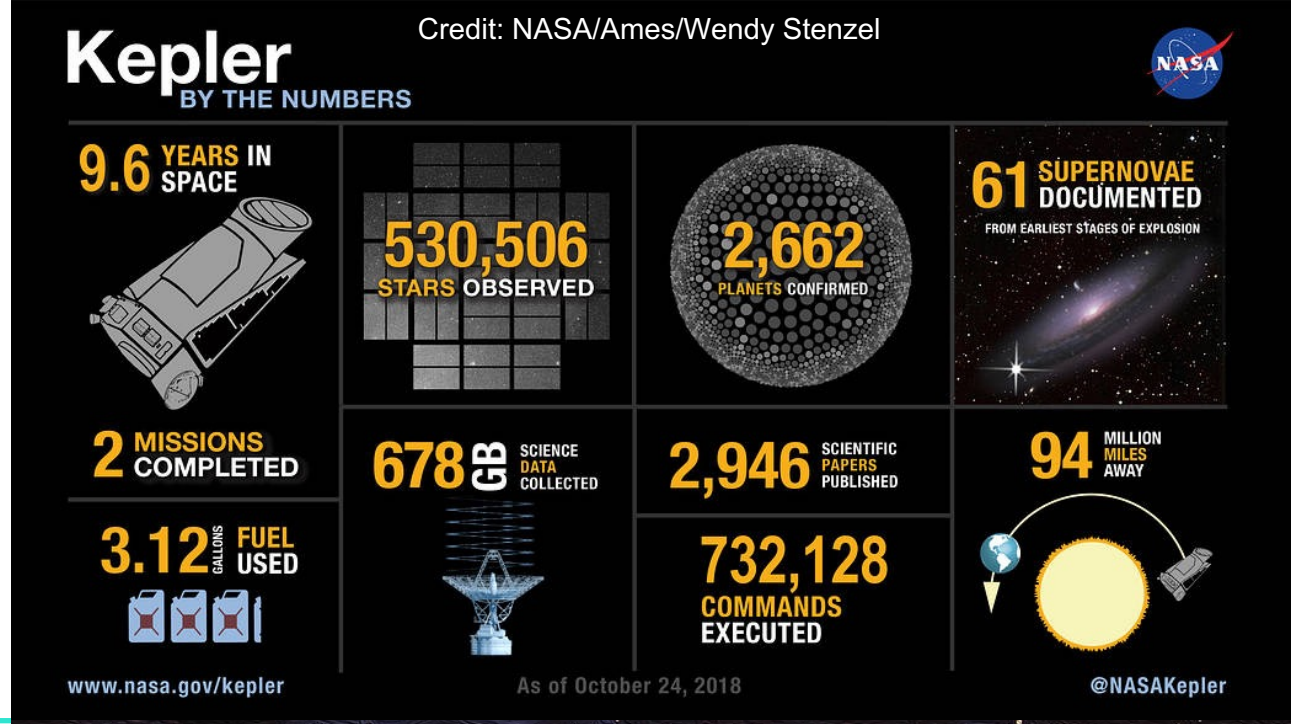

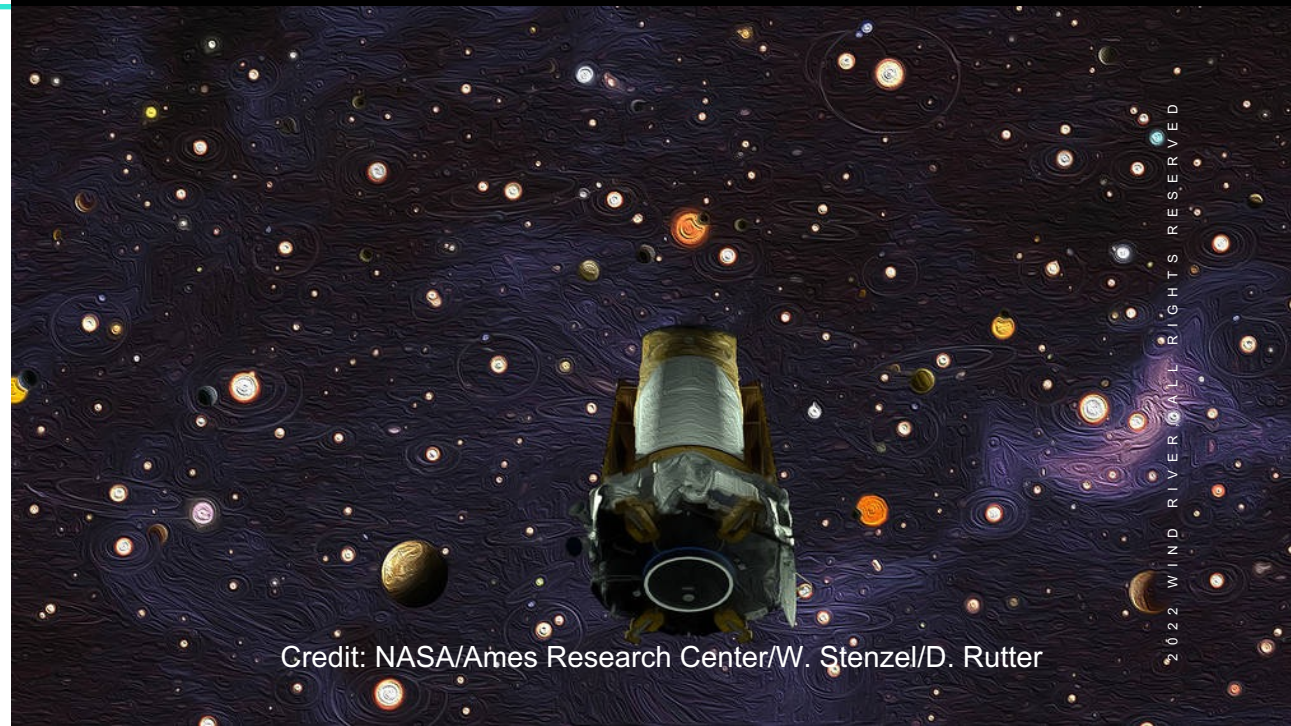

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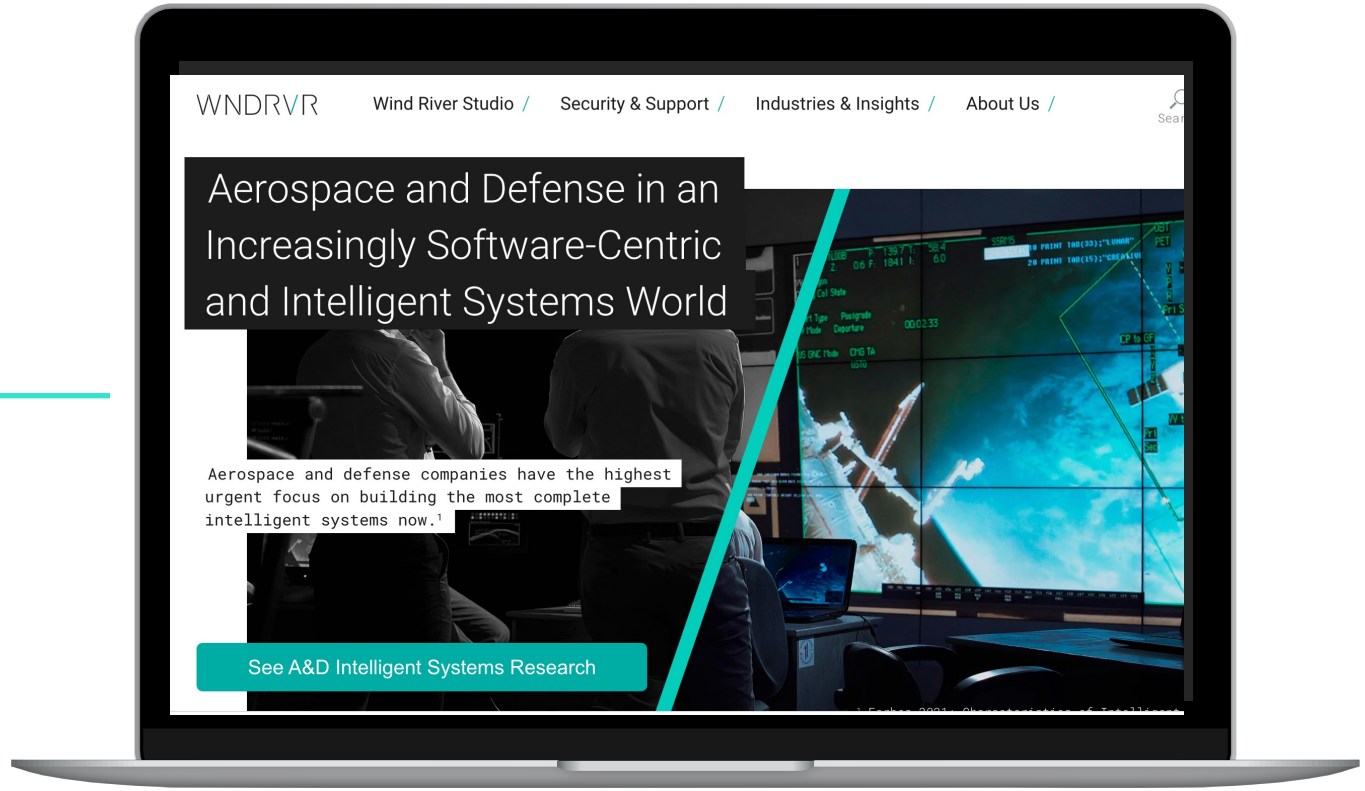

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