TROY TECHNICAL

SPACE INDUSTRY
WEEKLY REPORT

October 24 - October 30, 2026 | Issue 2026-W43

Mission evidence, launch economics, resilient supply and regulatory access

10	10
ANALYZED ARTICLES	PRIORITY THEMES

Issued 2026-10-30 | English edition | fixed approved cover artwork



Space Industry: the boundary moved from isolated claims to qualification evidence

10 English articles were reviewed independently from the Japanese edition. Ten themes are retained for management decisions.

SIGNAL 01 | COMPONENTS

Porous Heat Shield Simulation: 3D Ablation Interface Tracking

Researchers have developed a hybrid micro-continuum scale modeling approach to track 3D ablation interfaces in carbon fibrous preform porous media.

SIGNAL 02 | SPACECRAFT

ZBLAN Glass Fibre: ISS Microgravity Impact on Strength and Loss

An ISS experiment produced 11.8km of ZBLAN glass fibre, with space-drawn step-index fibres showing 80 per cent higher median ultimate tensile strength than Earth-made equivalents.

SIGNAL 03 | LAUNCH

ESA Celeste: LEO-PNT End-to-End Validation and IOD1 Specs

The European Space Agency's Celeste program has successfully demonstrated end-to-end LEO-PNT capabilities via the IOD1 satellite, with signals tracked and decoded by ground receivers.

SIGNAL 04 | ON-ORBIT SERVICE

NTT and JAXA LEO Satellite MIMO: 3x3 Capacity Gains and Specs

NTT and JAXA have successfully demonstrated in-orbit MIMO communication using the "LEOMI" device on the Small Demonstration Satellite-4, achieving a 2.67x increase in transmission capacity with a 3x3 configuration.

DECISION

Focus this week's management attention on mission evidence, launch economics, resilient supply and regulatory access. Move only when the linked evidence can be reproduced under your own operating conditions.

THREE MANAGEMENT MOVES

1. Buyers: separate announced missions from funded, licensed, launched and operational capability.
2. Suppliers: qualify components and services against mission environment, traceability and cadence.
3. Executives: track funding, licensing, launch date, on-orbit performance, capacity and insurance.

EVIDENCE DISCIPLINE

FACT states what the collected English source reports. BUSINESS READ and ACTION are editorial interpretations. UNKNOWN lists information that the source file does not establish. A linked article is not treated as independent confirmation of every claim.

Five numbers or evidence anchors that require conditions

11.8km
A01

SOURCE-BOUND CONDITION
An ISS experiment produced 11.8km of ZBLAN glass fibre, with space-drawn step-index fibres showing 80 per cent higher median ultimate tensile strength than Earth-made equivalents.

2.67x
A03

SOURCE-BOUND CONDITION
NTT and JAXA have successfully demonstrated in-orbit MIMO communication using the " LEOMI" device on the Small Demonstration Satellite-4, achieving a 2.67x increase in transmission capacity with a 3x3 configuration.

11.1 tim es
A05

SOURCE-BOUND CONDITION
Researchers from the Deep Space Exploration Laboratory have developed a dual-active site catalyst, MOF-808-NaCu, that increases methanol synthesis from CO2 by approximately 11.1 times compared to a copper-only control.

80%
A07

SOURCE-BOUND CONDITION
This milestone increases the H3's overall success rate to 80% and marks the first " just-on-time" launch without delays for the vehicle.

19 years
A06

SOURCE-BOUND CONDITION
By analyzing 19 years of data from the DMSP F16 satellite, the team quantified how the balance between auroral electrons and ionospheric plasma determines charging levels.

HOW TO USE THESE NUMBERS
Each value is shown with the condition stated in the collected English article. Do not compare values across different test methods, device sizes, operating temperatures or commercial stages without normalizing those conditions.

Where the value chain moved

Each stage combines one leading theme and one supporting theme. The report treats handoffs as evidence transfers, not decorative arrows.

1

Components

P01/P06

Researchers have developed a hybrid micro-continuum scale modeling approach to track 3D ablation interfaces in carbon fibrous.

2

Spacecraft

P02/P07

An ISS experiment produced 11.8km of ZBLAN glass fibre, with space-drawn step-index fibres showing 80 per cent higher median.

3

Launch

P03/P08

The European Space Agency's Celeste program has successfu lly demonstrated end-to-end LEO-PNT capabilities via the IOD1.

4

On-orbit service

P04/P09

NTT and JAXA have successfully demonstrated in-orbit MIMO communication using the "LEOMI" device on the Small Demonstration.

5

Downstream market

P05/P10

Researchers from the Deep Space Exploratio n Laboratory have developed a dual-activ e site catalyst, MOF-808-NaCu, that.

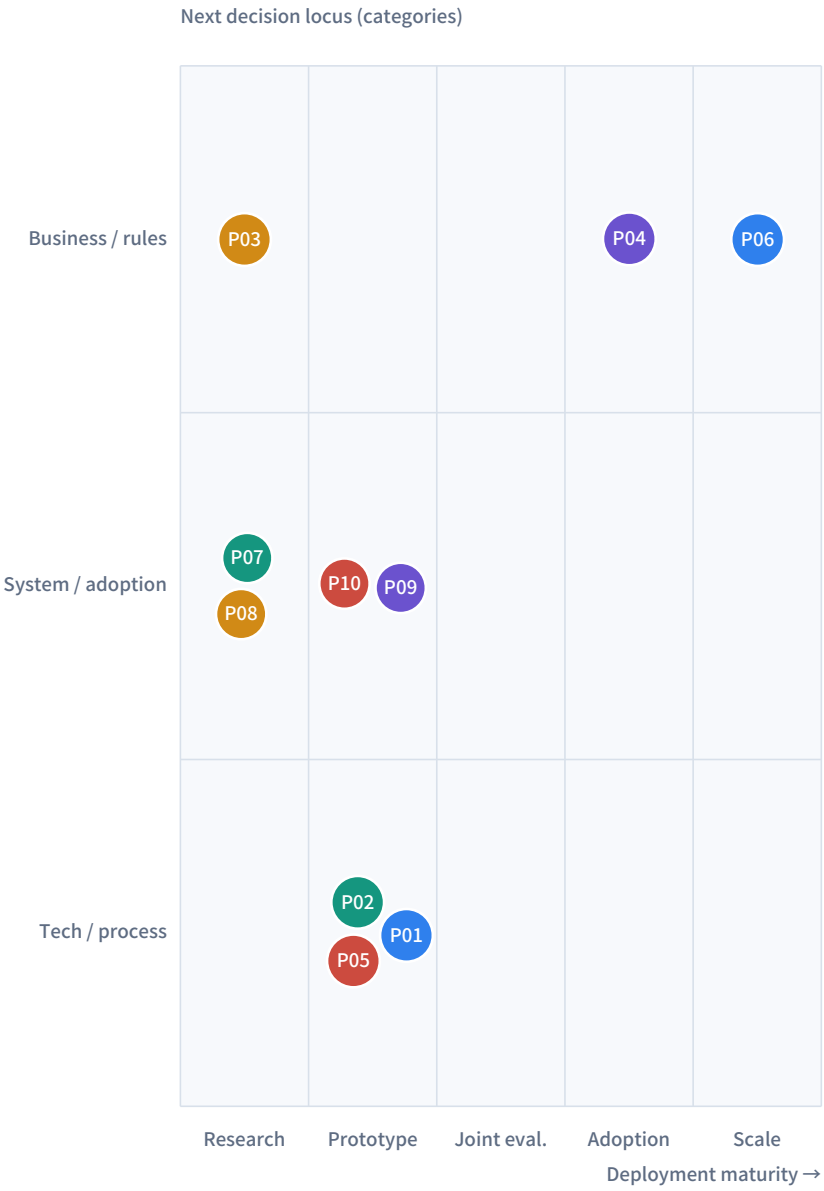
EVIDENCE REQUIRED AT EACH HANDOFF

Components to Spacecraft	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck funding, licensing, launch date, on-orbit performance, capacity and insurance.
Spacecraft to Launch	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck funding, licensing, launch date, on-orbit performance, capacity and insurance.
Launch to On-orbit service	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck funding, licensing, launch date, on-orbit performance, capacity and insurance.
On-orbit service to Downstream market	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck funding, licensing, launch date, on-orbit performance, capacity and insurance.

COMMON CONTROL POINT

No theme moves to a commercial commitment until a named owner has reproduced the relevant evidence and documented funding, licensing, launch date, on-orbit performance, capacity and insurance.

Priority map: maturity and next decision locus



P01	Porous Heat Shield Simulation: 3D Ablation Interface Tracking Tech / process | cue: no system/business cue
P02	ZBLAN Glass Fibre: ISS Microgravity Impact on Strength and Loss Tech / process | cue: no system/business cue
P03	ESA Celeste: LEO-PNT End-to-End Validation and IOD1 Specs Business / rules | cue: infrastructure
P04	NTT and JAXA LEO Satellite MIMO: 3x3 Capacity Gains and Specs Business / rules | cue: Capacity
P05	MOF-808-NaCu Catalyst: Methanol Synthesis for Mars ISRU 2026 Tech / process | cue: no system/business cue
P06	Starlink V3: SpaceX's 1Tbps Satellite Specs and Orbit Roadmap Business / rules | cue: capacity
P07	H3 Rocket Flight 10: MMX Launch Success and 80% Reliability System / adoption | cue: Launch
P08	Microchip PIC64-HPSC: RISC-V Spaceflight Computing Milestones System / adoption | cue: platform
P09	Satellite Surface Charging: AI-Based Detection via CNN and 19-Year Dataset System / adoption | cue: operational
P10	Space Mobility: Lunar Road System and "Mechanical Gravity" Roadmap System / adoption | cue: System

REPRODUCIBLE POSITIONING RULE

Horizontal position uses five discrete stages: Research, Prototype, Joint evaluation, Product adoption and Scale. The vertical bands classify the next decision locus: Tech / process, System / adoption, or Business / rules (including supply systems). Article-title cues take precedence; the overview is used only when the title is silent. These are categories, not impact ranks. Bubble diameter reflects the editorial score.

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P01 Porous Heat Shield Simulation: 3D Ablation Interface Tracking

A10 | Components | Pilot

Date not stated

FACT

Researchers have developed a hybrid micro-continuum scale modeling approach to track 3D ablation interfaces in carbon fibrous preform porous media. The simulation reproduces experimentally observed recession patterns and reveals that porous carbon surface recession does not proceed at a steady pace. This provides a more accurate method for predicting the degradation of thermal protection systems in aerospace vehicles.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P01.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

P02 ZBLAN Glass Fibre: ISS Microgravity Impact on Strength and Loss

A01 | Spacecraft | Pilot

Date not stated

FACT

An ISS experiment produced 11.8km of ZBLAN glass fibre, with space-drawn step-index fibres showing 80 per cent higher median ultimate tensile strength than Earth-made equivalents. The results demonstrate that microgravity can reduce manufacturing defects and improve mechanical reliability, though optical gains vary by fibre structure.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P02.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P03 ESA Celeste: LEO-PNT End-to-End Validation and IOD1 Specs

A08 | Launch | Research

Date not stated

FACT

The European Space Agency's Celeste program has successfully demonstrated end-to-end LEO-PNT capabilities via the IOD1 satellite, with signals tracked and decoded by ground receivers. The validation confirms that low Earth orbit signals can be integrated with existing navigation infrastructure to potentially add new capabilities.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P03.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 1/5 | DECISION LOCUS: BUSINESS / RULES

P04 NTT and JAXA LEO Satellite MIMO: 3x3 Capacity Gains and Specs

A03 | On-orbit service | Product adoption

Date not stated

FACT

NTT and JAXA have successfully demonstrated in-orbit MIMO communication using the "LEOMI" device on the Small Demonstration Satellite-4, achieving a 2.67x increase in transmission capacity with a 3x3 configuration. The test confirms that capacity gains scale with antenna count and that simulated channel models align with actual orbit measurements. This technology enables higher spectral efficiency for high-definition imagery and wide-area IoT connectivity.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P04.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 4/5 | DECISION LOCUS: BUSINESS / RULES

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P05 MOF-808-NaCu Catalyst: Methanol Synthesis for Mars ISRU 2026

A05 | Downstream market | Pilot

Date not stated

FACT

Researchers from the Deep Space Exploration Laboratory have developed a dual-active site catalyst, MOF-808-NaCu, that increases methanol synthesis from CO2 by approximately 11.1 times compared to a copper-only control. This material design demonstrates a potential pathway for In-Situ Resource Utilization (ISRU) on Mars by producing a fuel that is easier to store at room temperature than methane.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P05.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

P06 Starlink V3: SpaceX's 1Tbps Satellite Specs and Orbit Roadmap

A09 | Components | Scale-up

Date not stated

FACT

SpaceX has deployed the first 26 Starlink V3 satellites via Starship Flight 14, featuring a massive increase in capacity to 1Tbps per satellite. By combining larger hardware with lower orbital altitudes, SpaceX aims to transition from basic coverage to high-density communication capable of supporting urban areas and gigabit-class services.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P06.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 5/5 | DECISION LOCUS: BUSINESS / RULES

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P07 H3 Rocket Flight 10: MMX Launch Success and 80% Reliability

A07 | Spacecraft | Research

Date not stated

FACT

JAXA and Mitsubishi Heavy Industries (MHI) successfully launched the H3 rocket's 10th flight on October 20, 2026, deploying the Martian Moons eXploration (MMX) probe. This milestone increases the H3's overall success rate to 80% and marks the first "just-on-time" launch without delays for the vehicle.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P07.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 19/25 | MATURITY 1/5 | DECISION LOCUS: SYSTEM / ADOPTION

P08 Microchip PIC64-HPSC: RISC-V Spaceflight Computing Milestones

A02 | Launch | Research

Date not stated

FACT

Microchip has achieved key development milestones for its PIC64-HPSC 64-bit multicore RISC-V computing platform, including successful radiation characterization. The platform is designed to enable high-performance onboard processing for autonomous and data-intensive space missions from Low Earth Orbit to Mars.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P08.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 19/25 | MATURITY 1/5 | DECISION LOCUS: SYSTEM / ADOPTION

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P09 Satellite Surface Charging: AI-Based Detection via CNN and 19-Year Dataset

A06 | On-orbit service | Pilot

Date not stated

FACT

Researchers from Kyushu Institute of Technology and JAXA developed a world-first AI method using Convolutional Neural Networks (CNN) to automatically detect surface charging on satellites. By analyzing 19 years of data from the DMSP F16 satellite, the team quantified how the balance between auroral electrons and ionospheric plasma determines charging levels. This advancement enables better risk assessment for satellite design and operational longevity.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P09.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 19/25 | MATURITY 2/5 | DECISION LOCUS: SYSTEM / ADOPTION

P10 Space Mobility: Lunar Road System and "Mechanical Gravity" Roadmap

A04 | Downstream market | Pilot

Date not stated

FACT

Space Mobility has developed a lunar road system using in-situ resource utilization (ISRU) to increase rover driving capability from 25% to 99% of Earth levels. By utilizing " Mechanical Gravity" via interlocking tiles and guide channels, the system aims for first lunar deployment in 2028.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P10.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 19/25 | MATURITY 2/5 | DECISION LOCUS: SYSTEM / ADOPTION

Playbook and 0-5 year roadmap

STAKEHOLDER	NOW | 0-30 DAYS	NEXT | 1-12 MONTHS	LATER | 1-5 YEARS
Operating companies	separate announced missions from funded, licensed, launched and operational capability	Run production-like qualification with explicit acceptance and stop criteria.	Build a portfolio and architecture that can absorb technology and supplier changes.
Materials, equipment and technology suppliers	qualify components and services against mission environment, traceability and cadence	Create shared reliability, process-window and failure-analysis data with customers.	Standardize interfaces, traceability, lifecycle support and recovery services.
Trading, investment and legal teams	Map funding, licensing, launch date, on-orbit performance, capacity and insurance.	Contract for capacity, quality, change notice, liability, alternatives and exit.	Diversify regional, technical and customer concentration risk.

ROADMAP

NOW | 0-30 DAYS
Evidence ledger
Owner: Strategy + quality
Deliverable: claim, source, condition, owner

NOW | 0-30 DAYS
Risk screen
Owner: Procurement + legal
Deliverable: unknowns, alternatives, stop

NEXT | 1-12 MONTHS
Joint qualification
Owner: R&D + supplier
Deliverable: process window and failure data

NEXT | 1-12 MONTHS
Commercial gate
Owner: Business + finance
Deliverable: unit economics and capacity

LATER | 1-5 YEARS
Platform strategy
Owner: Executive team
Deliverable: portfolio and interface roadmap

LATER | 1-5 YEARS
Service layer
Owner: Operations + channel
Deliverable: monitoring, maintenance and recovery

GO / NO-GO GATES

GATE	OWNER	REQUIRED EVIDENCE	NO-GO CONDITION
G1 Evidence	**Quality**	Source, test conditions and reproducibility	No traceable evidence
G2 Integration	**R&D**	Interface, process window and failure analysis	Cannot meet system conditions
G3 Commercial	**Business**	Capacity, total cost, contract and alternatives	Economics or supply cannot be supported
G4 Lifecycle	**Operations**	Monitoring, maintenance, change notice and exit	No accountable operating plan

ANALYZED ARTICLES | ITEMS 01-10

Every title and URL is displayed in full. URLs wrap without shortening and remain clickable. A verified-reference label means the translated HTML did not retain its original source URL.

ID	FULL ARTICLE TITLE	FULL SOURCE / VERIFIED REFERENCE URL - CLICKABLE
A01	ZBLAN Glass Fibre: ISS Microgravity Impact on Strength and Loss	https://www.electronicsforu.com/news/space-made-glass-fibre-shows-80-per-cent-higher-strength
A02	Microchip PIC64-HPSC: RISC-V Spaceflight Computing Milestones	https://www.electronicsmedia.info/2026/10/28/microchip-pic64-hpsc-spaceflight-computing/
A03	NTT and JAXA LEO Satellite MIMO: 3x3 Capacity Gains and Specs	https://finance.biggo.com/news/cc76f437-986e-4635-9863-2c955b16961a
A04	Space Mobility: Lunar Road System and "Mechanical Gravity" Roadmap	https://www.prnewswire.com/news-releases/roads-on-the-moon-space-mobility-unveils-mechanical-gravity-and-a-patent-pending-lunar-road-system-302918729.html
A05	MOF-808-NaCu Catalyst: Methanol Synthesis for Mars ISRU 2026	https://xenospectrum.com/mars-air-to-methanol-catalyst-mof-808-nacu/
A06	Satellite Surface Charging: AI-Based Detection via CNN and 19-Year Dataset	https://news.yahoo.co.jp/articles/2323eb3c3b2d87c4dfd1c6fff550d8c158185aa0
A07	H3 Rocket Flight 10: MMX Launch Success and 80% Reliability	https://news.mynavi.jp/techplus/article/H3F10_MMX-4/
A08	ESA Celeste: LEO-PNT End-to-End Validation and IOD1 Specs	https://insidegnss.com/esas-celeste-demonstrates-end-to-end-leo-pnt-in-orbit/
A09	Starlink V3: SpaceX's 1Tbps Satellite Specs and Orbit Roadmap	https://www.watch.impress.co.jp/docs/topic/2150444.html
A10	Porous Heat Shield Simulation: 3D Ablation Interface Tracking	https://bioengineer.org/new-3d-simulation-tracks-moving-ablation-interfaces-in-porous-heat-shields/

SpaceIndustry — Selected Articles

Date: 2026-10-31

Articles: 10

Table of Contents

#01 ZBLAN Glass Fibre: ISS Microgravity Impact on Strength and Loss

#02 Microchip PIC64-HPSC: RISC-V Spaceflight Computing Milestones

#03 NTT and JAXA LEO Satellite MIMO: 3x3 Capacity Gains and Specs

#04 Space Mobility: Lunar Road System and "Mechanical Gravity" Roadmap

#05 MOF-808-NaCu Catalyst: Methanol Synthesis for Mars ISRU 2026

#06 Satellite Surface Charging: AI-Based Detection via CNN and 19-Year Dataset

#07 H3 Rocket Flight 10: MMX Launch Success and 80% Reliability

#08 ESA Celeste: LEO-PNT End-to-End Validation and IOD1 Specs

#09 Starlink V3: SpaceX's 1Tbps Satellite Specs and Orbit Roadmap

#10 Porous Heat Shield Simulation: 3D Ablation Interface Tracking

#01 ZBLAN Glass Fibre: ISS Microgravity Impact on Strength and Loss

Published October 27, 2026 Electronics For You UK

OVERVIEW

An ISS experiment produced 11.8km of ZBLAN glass fibre, with space-drawn step-index fibres showing 80 per cent higher median ultimate tensile strength than Earth-made equivalents. The results demonstrate that microgravity can reduce manufacturing defects and improve mechanical reliability, though optical gains vary by fibre structure.

IN DEPTH

Key Findings

Space-manufactured ZBLAN fibre exhibits significantly higher mechanical strength than terrestrial versions. Specifically, the median ultimate tensile strength increased by 80 per cent for step-index fibres and 25 per cent for single-index fibres. Additionally, space-drawn step-index fibres showed a 39 per cent increase in the Weibull modulus, indicating greater consistency and reliability in material strength.

Technical Details

The experiment utilized an automated fibre-drawing machine developed by Flawless Photonics and researchers from several institutions, including Adelaide University. The system automated glass preform feeding, drawing, diameter monitoring, and collection within the ISS's mass, power, and volume constraints. Out of the 11.8km produced, 2.1km of uniform-diameter samples were selected for testing.

Researchers compared two structures:

- **Single-index fibres:** Composed of glass with one refractive index.
- **Step-index fibres:** Featuring a core and cladding with different refractive indices to confine light.

While step-index fibres showed lower optical attenuation in space, no measurable optical difference was observed in single-index fibres.

Background & Context

ZBLAN is a heavy-metal fluoride glass (zirconium, barium, lanthanum, aluminium, and sodium) targeted for mid-infrared applications due to its potential for lower optical attenuation than silica glass. However, terrestrial manufacturing often suffers from crystallisation during the drawing process, where small crystals form and scatter light. Microgravity is used to mitigate gravity-driven flow and material separation to reduce these defects.

Significance & Outlook

Despite strength gains, orbital manufacturing does not eliminate all losses; impurities and bubbles in preforms still impact performance. For ZBLAN to replace optimized silica fibre, it must prove a practical advantage to justify the costs of orbital production. Future viability depends on scaling automated equipment and establishing efficient return logistics. This research also informs future space infrastructure, such as India's planned Bharatiya Antariksh Station, with its first module intended for 2028.

Source: https://www.electronicsforu.com/news/space-made-glass-fibre-shows-80-per-cent-higher-strength

#02 Microchip PIC64-HPSC: RISC-V Spaceflight Computing Milestones

Published October 28, 2026 Electronics Media USA

OVERVIEW

Microchip has achieved key development milestones for its PIC64-HPSC 64-bit multicore RISC-V computing platform, including successful radiation characterization. The platform is designed to enable high-performance onboard processing for autonomous and data-intensive space missions from Low Earth Orbit to Mars.

IN DEPTH

Key Findings

Microchip Technology has reached several critical milestones for the PIC64-HPSC High-Performance Spaceflight Computing Series. Early radiation characterization of the PIC64-HPSC1000-RH radiation-hardened variant demonstrated Total Ionizing Dose (TID) performance up to 200 krad(Si) and successful Single Event Latch-up (SEL) testing to 78.2 MeV·cm²/mg under specified operating conditions. Additionally, Single Event Effects (SEE) characterization showed robust system-controller operation with no external resets or uncorrected errors required during testing to date.

Technical Details

The PIC64-HPSC is a 64-bit multicore RISC-V computing platform. Initial silicon performance measurements align with program objectives, supporting compute-intensive workloads including:

- Onboard autonomy and spacecraft control
- High-performance payload processing
- Earth observation and intelligence
- Secure communications and edge AI
- Scientific exploration

The architecture is designed for scalability, supporting software-defined spacecraft, distributed processing, and heterogeneous computing. Through the Early Access Program, customers are currently evaluating silicon and development kits using supporting software and tools. Furthermore, board partners are developing VPX and VNX+ computing platforms based on the PIC64-HPSC.

Background and Context

The PIC64-HPSC originated from a NASA and JPL assessment of future spaceflight computing requirements, leading to a contract awarded to Microchip in 2022. This program served as the foundation for Microchip's broader 64-bit computing portfolio, which now includes a range of PIC64 MPUs for various markets.

Significance and Outlook

Increased onboard processing capability reduces dependence on communications bandwidth and lowers decision-making latency for spacecraft. The necessity of this technology is highlighted by NASA's FY26 Civil Space Shortfall Prioritization, which ranked advanced onboard computing for space operations as the third-highest civil space technology shortfall. The PIC64-HPSC aims to support the next generation of civil, commercial, scientific, and defense systems operating in demanding space environments.

Source: https://www.electronicsmedia.info/2026/10/28/microchip-pic64-hpsc-spaceflight-computing/

Collected: October 31, 2026 | Automated Research System (AI)

#03 NTT and JAXA LEO Satellite MIMO: 3x3 Capacity Gains and Specs

Published October 23, 2026 BigGo Finance Japan

OVERVIEW

NTT and JAXA have successfully demonstrated in-orbit MIMO communication using the "LEOMI" device on the Small Demonstration Satellite-4, achieving a 2.67x increase in transmission capacity with a 3x3 configuration. The test confirms that capacity gains scale with antenna count and that simulated channel models align with actual orbit measurements. This technology enables higher spectral efficiency for high-definition imagery and wide-area IoT connectivity.

IN DEPTH

Key Findings

In-orbit demonstrations conducted in May 2026 confirmed that MIMO (multiple-input multiple-output) technology significantly expands communication capacity on the feeder link from a low-Earth-orbit (LEO) satellite to a ground base station. Compared to conventional SISO (single-input single-output) transmission, the 2x2 MIMO configuration achieved an average transmission capacity of approximately 1.94x, while the 3x3 configuration reached approximately 2.67x.

Technical Details

The demonstration utilized the "LEOMI" LEO satellite MIMO/IoT transmission device. To overcome challenges associated with constant channel changes, signal arrival time variances, and Doppler shifts, NTT and JAXA integrated three specific technologies:

- Time-frequency asynchronous interference compensation
- Channel modeling
- Control-carrier-less MIMO demodulation

Additionally, the partners tested satellite sensing using LPWA signals in the 920 MHz band. They successfully separated and demodulated overlapping waveforms transmitted simultaneously from two different ground locations to the satellite, proving that compact, power-efficient terminals can communicate on the same frequency concurrently.

Background and Context

The Small Demonstration Satellite-4 was launched on December 14, 2025, and began regular operations in March 2026. The results of these experiments will be presented at the "NTT R&D FORUM 2026" from November 18 to 25 as part of the "NTT C89" space business brand. Over the next year, further experiments with varying antenna numbers across different satellite passes will be conducted to statistically evaluate capacity effects.

Significance and Outlook

This technology is a core component of NTT's "Space Integrated Computing Network" concept. By improving spectral efficiency, the system can support higher transmission speeds for radar data and high-definition imagery, benefiting disaster prediction, ocean observation, and weather accuracy. Furthermore, because satellite sensing bypasses ground base stations, it enables low-cost IoT deployment for environmental monitoring and infrastructure inspection in remote mountainous or oceanic regions.

Source: https://finance.biggo.com/news/cc76f437-986e-4635-9863-2c955b16961a

Collected: October 31, 2026 | Automated Research System (AI)

#04 Space Mobility: Lunar Road System and "Mechanical Gravity" Roadmap

Published October 27, 2026 PR Newswire USA

OVERVIEW

Space Mobility has developed a lunar road system using in-situ resource utilization (ISRU) to increase rover driving capability from 25% to 99% of Earth levels. By utilizing "Mechanical Gravity" via interlocking tiles and guide channels, the system aims for first lunar deployment in 2028.

IN DEPTH

Key Findings

Space Mobility has developed a lunar infrastructure system consisting of interlocking tiles manufactured on-site from lunar regolith. The system introduces "Mechanical Gravity," which restores a rover's driving capability to approximately 99% of its Earth performance, compared to roughly 25% on bare regolith. The company has filed a provisional patent application as of September 2026 covering 185 claims and is currently conducting ground validation.

Technical Details

The system addresses the low-traction environment of the Moon, where a 3.6 metric ton rover traveling at 32 km/h on bare regolith requires approximately 70 meters to stop and has a turning radius of about 139 meters. The Space Mobility road utilizes the following technical features:

- **Mechanical Gravity:** A recessed guide channel in each tile houses a sled tethered to the vehicle, holding the vehicle down and on line.
- **ISRU Manufacturing:** Tiles are produced from lunar regolith; the company focuses on the geometry of tabs, sockets, and mold profiles.
- **Integrated Infrastructure:** Road tiles contain conduits for power and communications.
- **Navigation:** The guide channel provides a fixed path for autonomous vehicles, removing the need for lighting or navigation signals.

With a channel brake, the stopping distance for a 3.6 metric ton rover at 32 km/h is reduced to approximately 4.5 m.

Background and Context

The technology aligns with NASA's accelerated Artemis schedule, which targets astronauts on the lunar surface in 2028. The system addresses gaps identified in NASA's 2026 Civil Space Shortfalls list, specifically regarding landing pads, site preparation, load-bearing structures, and crew mobility. Space Mobility has partnered with two U.S. universities specializing in aerospace engineering and space resources to accelerate research.

Significance and Outlook

The manufacturing process used for road tiles can be adapted to create landing pad segments, habitat foundations, and shielding blocks. The company's roadmap targets the completion of ground validation in 2027, the deployment of the first demonstration tile in 2028, and full lunar highway production for a permanent Moon base between 2030 and 2032.

Source: https://www.prnewswire.com/news-releases/roads-on-the-moon-space-mobility-unveils-mechanical-gravity-and-a-patent-pending-lunar-road-system-302918729.html

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#05 MOF-808-NaCu Catalyst: Methanol Synthesis for Mars ISRU 2026

Published October 28, 2026 XenoSpectrum China

OVERVIEW

Researchers from the Deep Space Exploration Laboratory have developed a dual-active site catalyst, MOF-808-NaCu, that increases methanol synthesis from CO2 by approximately 11.1 times compared to a copper-only control. This material design demonstrates a potential pathway for In-Situ Resource Utilization (ISRU) on Mars by producing a fuel that is easier to store at room temperature than methane.

IN DEPTH

Key Findings

The research team reported a methanol space-time yield (STY) of 245 g/(kg_cat·h) using the MOF-808-NaCu catalyst in a laboratory environment. When compared to the control catalyst (MOF-808-Cu), which yielded 22 g/(kg_cat·h), the sodium-promoted catalyst showed an approximately 11.1-fold increase in production speed. The study also noted a suppression of carbon monoxide (CO) generation, improving reaction selectivity.

Technical Details

The catalyst utilizes a metal-organic framework (MOF-808), a zirconium-based porous material. The team introduced alkali metals—specifically sodium (Na)—via deprotonation of hydroxyl groups, then loaded copper (Cu) to create dual-active sites. Density functional theory (DFT) calculations and measurements suggest that Na+ ions strengthen the interaction with oxygen atoms in CO2, promoting adsorption and activation. Additionally, sodium prevents copper atoms from aggregating into nanoparticles, maintaining atomic-level dispersion.

The synthesis follows the chemical equation: CO2 + 3H2 → CH3OH + H2O. While the catalyst shows high activity, the researchers emphasized that these results were obtained in a controlled flow reactor with pressurized gases, not in the actual Martian environment.

Background and Context

Mars' atmosphere consists of approximately 95.9% CO2. While methane (CH4) is a common target for ISRU via the Sabatier reaction, it requires cryogenic cooling for liquid storage (boiling point -161.5°C). Methanol (CH3OH) offers a logistical advantage with a boiling point of 64.7°C and a melting point of -97.6°C, allowing for easier liquid storage and potential use as a chemical feedstock for plastics or antifreeze.

Significance and Outlook

The results, published in the *Journal of Deep Space Exploration*, provide a material-level proof of concept for fuel production. However, significant engineering hurdles remain, including the need for equipment to capture and compress the thin Martian atmosphere (average 7 millibars), the mining of ice for water electrolysis to supply hydrogen, and the verification of catalyst longevity over thousands of hours.

Source: https://xenospectrum.com/mars-air-to-methanol-catalyst-mof-808-nacu/

Collected: October 31, 2026 | Automated Research System (AI)

#06 Satellite Surface Charging: AI-Based Detection via CNN and 19-Year Dataset

Published October 29, 2026 sorae（Yahoo!ニュース配信） Japan

OVERVIEW

Researchers from Kyushu Institute of Technology and JAXA developed a world-first AI method using Convolutional Neural Networks (CNN) to automatically detect surface charging on satellites. By analyzing 19 years of data from the DMSP F16 satellite, the team quantified how the balance between auroral electrons and ionospheric plasma determines charging levels. This advancement enables better risk assessment for satellite design and operational longevity.

IN DEPTH

Key Findings

A research group from Kyushu Institute of Technology and JAXA has developed a method to automatically detect satellite surface charging using artificial intelligence. By applying this system to observation data from the U.S. military weather satellite DMSP F16 spanning 2005 to 2023, the team identified approximately 3,000 charging events. The analysis revealed that while high-energy electrons causing auroras increase satellite charging, the inflow of positive ions within the surrounding ionospheric plasma acts to suppress negative charging.

Technical Details

The detection system utilizes a Convolutional Neural Network (CNN), a type of AI typically used for image recognition, to automate the identification of charging phenomena. This replaces previous manual methods where human operators had to visually verify charging candidates extracted from observation data, a process that was too labor-intensive for long-term statistical analysis. The study quantitatively demonstrated that the intensity of satellite charging is determined by the balance between auroral electrons and the surrounding plasma.

Background and Context

Unlike ground-based electrical equipment, satellites cannot be grounded. Consequently, electrons in space can accumulate on the satellite surface. If significant potential differences develop between different areas of the surface, electrostatic discharges (sparks) can occur. These discharges pose a risk to satellite operations by potentially damaging surface materials and solar cells.

Significance and Outlook

The research, published in the journal "Space Weather" on October 27, 2026, provides a foundation for predicting the specific times and locations where satellites are most prone to charging. The research group intends to expand their analysis to previous periods of higher auroral activity to further refine these predictions. As the number of satellites in low Earth orbit increases for communication and Earth observation, this AI-driven detection method will support the design of charging-resistant satellites and the implementation of operational strategies to avoid hardware failure.

Source: https://news.yahoo.co.jp/articles/2323eb3c3b2d87c4dfd1c6fff550d8c158185aa0

Collected: October 31, 2026 | Automated Research System (AI)

#07 H3 Rocket Flight 10: MMX Launch Success and 80% Reliability

Published October 27, 2026　マイナビニュース　Japan

OVERVIEW

JAXA and Mitsubishi Heavy Industries (MHI) successfully launched the H3 rocket's 10th flight on October 20, 2026, deploying the Martian Moons eXploration (MMX) probe. This milestone increases the H3's overall success rate to 80% and marks the first "just-on-time" launch without delays for the vehicle.

IN DEPTH

Key Findings

The H3 rocket Flight 10 successfully placed the MMX probe into its designated trajectory, marking the third consecutive success for the vehicle (Flights 6, 9, and 10). With 8 out of 10 flights successful, the H3's success rate has reached 80%. This mission also achieved the first launch for the H3 without any weather-related delays, a feat not seen at the Tanegashima Space Center since the H-IIA Flight 43 approximately six years ago.

Technical Details

Flight 10 utilized the "24L" configuration, the strongest variant featuring a domestic long fairing manufactured by Kawasaki Heavy Industries. This success completes the verification of all H3 configurations, ranging from the cost-effective "30S" (without solid rocket boosters) to the "24L" for large geostationary and small satellite constellations. The only remaining development milestone is the "LE-9" engine type 2.

The MMX probe has a launch weight of 4,480kg, including 3,030kg of propellant (1,840kg for the outbound journey and 1,190kg for the return). The launch sequence was highly precise, with errors of only a few seconds per event; MMX separation occurred 1 hour, 11 minutes, and 13 seconds after liftoff. To prevent planetary contamination, the second stage (LE-5B-3) expelled remaining propellant to ensure it would move away from Mars after exiting Earth's orbit.

Background and Context

The H3 program faced early challenges, including a failure of the first flight and a subsequent failure of Flight 8. However, the program recovered within six months of the second failure. The MMX mission was delayed by two years due to H3 development lags, which allowed JAXA to increase propellant loads to improve mission robustness.

Significance and Outlook

MHI reports an increase in satellite launch inquiries compared to previous years, citing the improved reliability of the H3. The MMX probe is now in its initial checkout phase, with the next critical milestone being the Mars orbit insertion scheduled for August 2027. The mission aims for a return to Earth by July 2031.

Source: https://news.mynavi.jp/techplus/article/H3F10_MMX-4/

Collected: October 31, 2026 | Automated Research System (AI)

#08 ESA Celeste: LEO-PNT End-to-End Validation and IOD1 Specs

Published October 26, 2026 Inside GNSS USA

OVERVIEW

The European Space Agency's Celeste program has successfully demonstrated end-to-end LEO-PNT capabilities via the IOD1 satellite, with signals tracked and decoded by ground receivers. The validation confirms that low Earth orbit signals can be integrated with existing navigation infrastructure to potentially add new capabilities.

IN DEPTH

Key Findings

The Celeste program has achieved a major milestone with the first in-orbit demonstration (IOD) of a Low Earth Orbit Positioning, Navigation, and Timing (LEO-PNT) system. Results presented at ION GNSS+ 2026 by Carlos Catalán of GMV confirm that navigation signals transmitted from the IOD1 satellite were successfully tracked and decoded by ground receivers, validating the end-to-end functionality of the system.

Technical Details

Launched on March 28, 2026, via a Rocket Lab electron vehicle from New Zealand, IOD1 operates in a 510-kilometer near-polar sun-synchronous orbit. The satellite's payload autonomously determines its orbit and synchronizes timing to Galileo System Time using GNSS observations and navigation data. It transmits navigation messages across the E5 and SR bands, with the latter utilizing the RNSS S-band allocation.

Validation was conducted at ESA’s ESTEC facility in the Netherlands using high-gain antennas and spectrum analyzers. Technical measurements confirmed the following:

- E5 and SR-band power spectra closely matched expected waveforms.
- Effective isotropic radiated power was consistent with the payload link budget.
- Signal shapes and transmission levels were as predicted, including analysis of S-curve bias and correlation loss.

Reception was verified using both a dedicated Celeste test user receiver and a separate representative user receiver developed by Septentrio using an omnidirectional antenna.

Background & Context

IOD1 is one of two demonstration satellites launched on the same day, with parallel contracts led by GMV and Thales Alenia Space France. The demonstration architecture integrates the satellite with a ground segment as a service, a test-user segment, and an experimentation segment.

Significance & Outlook

This demonstration serves as a critical step in evaluating whether LEO signals can enhance Europe's established satellite navigation infrastructure. Future work will focus on assessing positioning performance and user-equivalent range error. The roadmap includes four follow-on satellites—IOD3, IOD5, IOD7, and IOD9—designed to introduce additional capabilities and frequency bands.

Source: https://insidegnss.com/esas-celeste-demonstrates-end-to-end-leo-pnt-in-orbit/

Collected: October 31, 2026 | Automated Research System (AI)

#09 Starlink V3: SpaceX's 1Tbps Satellite Specs and Orbit Roadmap

Published October 29, 2026 Impress Watch Japan

OVERVIEW

SpaceX has deployed the first 26 Starlink V3 satellites via Starship Flight 14, featuring a massive increase in capacity to 1Tbps per satellite. By combining larger hardware with lower orbital altitudes, SpaceX aims to transition from basic coverage to high-density communication capable of supporting urban areas and gigabit-class services.

IN DEPTH

Key Findings

The Starlink V3 satellite represents a significant leap in capacity and scale, designed specifically for deployment via the Starship launch system. Each V3 satellite delivers a maximum downlink capacity of 1Tbps and an uplink capacity of 160Gbps. This marks a tenfold increase in downlink and a 22-fold increase in uplink performance compared to V2 satellites. SpaceX intends to deploy up to 60 V3 satellites per Starship launch.

Technical Specifications

- **Physical Scale:** Approximately 7m in length (folded) with a mass of about 2 tons.
- **Beam Capacity:** 2,048 downlink and 2,048 uplink beams, compared to 192 downlink and 144 uplink beams in V2.
- **Hardware:** New beam-forming chips and modem chips with approximately 64 times the processing power of previous versions.
- **Power and Connectivity:** Solar array power generation is roughly double that of V2, utilizing four 19m solar cells. Connectivity includes six 400Gbps-class lasers for inter-satellite links and 1.2Tbps RF backhaul, supporting Ka, E, V, and W bands.

Orbital Strategy and Frequency Reuse

SpaceX is shifting V3 operations to a lower altitude of 330–370km, compared to the 450–490km range used for V1/V2 broadband satellites. This lower orbit reduces signal loss and enables "frequency reuse." By narrowing the ground area covered by each beam, SpaceX can reuse the same frequencies in different geographic regions without interference, thereby increasing the total communication capacity per unit area.

System Architecture and Outlook

The Starlink ecosystem is split into two distinct constellations: broadband and Direct-to-Cell. V3 is a broadband satellite; it is separate from the "Mobile" line (V1 Mobile and V2 Mobile). While V3 focuses on high-capacity broadband, the V2 Mobile satellites—planned for Starship deployment starting in 2027—will handle direct smartphone communication. SpaceX expects these network improvements to enable gigabit-class services by the end of 2026, with existing Performance terminals supporting these upgrades without hardware changes.

Source: https://www.watch.impress.co.jp/docs/topic/2150444.html

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#10 Porous Heat Shield Simulation: 3D Ablation Interface Tracking

Published October 29, 2026 Bioengineer.org (Advances in Aerodynamics掲載論文の紹介)

OVERVIEW

Researchers have developed a hybrid micro-continuum scale modeling approach to track 3D ablation interfaces in carbon fibrous preform porous media. The simulation reproduces experimentally observed recession patterns and reveals that porous carbon surface recession does not proceed at a steady pace. This provides a more accurate method for predicting the degradation of thermal protection systems in aerospace vehicles.

IN DEPTH

Key Findings

The study demonstrates a 3D simulation capable of reproducing the morphological evolution of individual fibers and the non-steady pace of surface recession in porous carbon materials. In production simulations initialized at 3000 kelvin with oxygen concentrations of 2.713 moles per cubic meter, less than 30 percent of the original solid volume remained after 20 seconds of reaction. The results showed better agreement with the Lachaud model than previous two-dimensional models.

Technical Details

The researchers re-developed the dbsFoam solver on the open-source OpenFOAM platform to couple porous flow, heat transfer, and heterogeneous chemical reactions. The model utilizes a Darcy-Brinkman-Stokes momentum equation, which functions as the Navier-Stokes equation in pure gas regions and reduces to Darcy's law where gas and solid coexist. Key technical specifications include:

- **Chemistry:** Focused on the dominant carbon monoxide-producing pathway (solid carbon reacting with half a molecule of oxygen), releasing approximately 110 kilojoules per mole.
- **Material Parameters:** A 3D carbon fibrous preform with an initial porosity of 0.85, fibers of 11 micrometer diameter, and a maximum fiber length of 100 micrometers.
- **Computational Scale:** A grid of approximately 10.2 million cells was selected to balance accuracy and efficiency.
- **Physics:** Volume-averaged convection-diffusion equations track species, while fiber reactivity follows an Arrhenius-type temperature dependence.

Background & Context

Ablation is a self-protective mechanism where heat shields sacrifice layers of material to protect critical components. Modeling porous carbon/carbon composites is challenging because ablation is non-uniform; recession patterns depend on pore-scale geometry, fiber volume fractions, and orientations. Previous lattice Boltzmann methods often lacked clear physical quantities for direct experimental comparison or required excessive computational resources.

Significance & Outlook

By resolving the complex interactions between gas flow and the skeletal architecture of carbon composites, this hybrid approach allows engineers to better predict how surfaces roughen and reshape during atmospheric re-entry. The authors plan to incorporate more complex surface chemistry in future versions of the model.

Source: https://bioengineer.org/new-3d-simulation-tracks-moving-ablation-interfaces-in-porous-heat-shields/

Collected: October 31, 2026 | Automated Research System (AI)