

National Aeronautics and Space Administration



# SPINOFF

# 2023



National Aeronautics and Space Administration  
Technology Transfer Program  
NASA Headquarters  
Washington, DC 20546

[www.nasa.gov](http://www.nasa.gov)



# SPINOFF Features

From ventilators to robots and satellite imaging to Earthbound bacteria, NASA pursues any means to fulfill its mission to “explore the unknown in air and space, innovate for the benefit of humanity, and inspire the world through discovery.” The following pages reveal how that drive to innovate is both serving exploration and addressing a host of challenges on this planet.

## NASA’s VITAL Contribution to Global Pandemic Relief

NASA-designed ventilator helps save lives in developing nations



### Forging a New Path

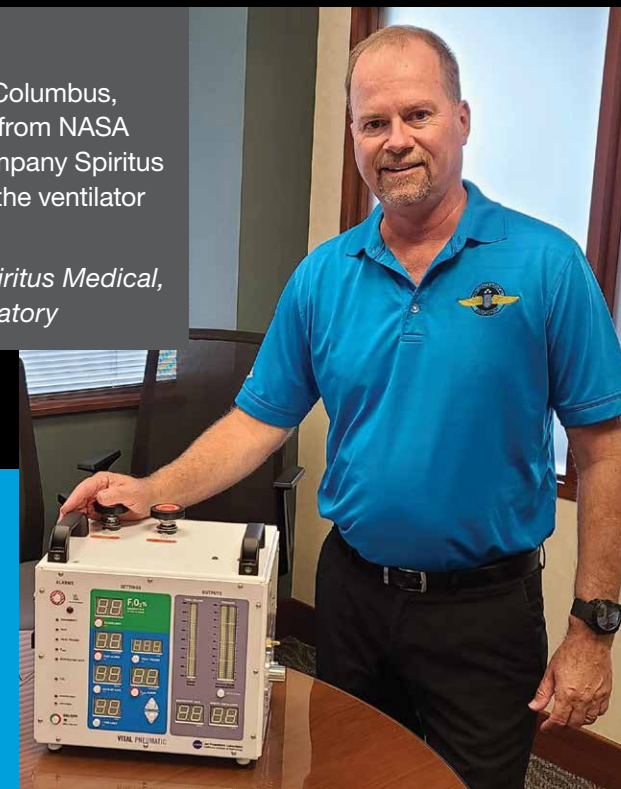
Bharat Forge of Pune, India, licensed VITAL to save lives in the country’s more rural areas and distribute to places in need around Asia and Africa.

*Bharat Forge,  
Jet Propulsion Laboratory*

### Ensuring Vitality

STARK Industries of Columbus, Ohio, licensed VITAL from NASA and spun off new company Spiritus Medical to distribute the ventilator around the world.

*STARK Industries/Spiritus Medical,  
Jet Propulsion Laboratory*



### Saving Lives from São Paulo

After licensing VITAL from NASA, Russer Brasil of Indaiatuba, Brazil, brought it into compliance with the country’s local requirements, selling hundreds of units.

*Russer Brasil, Jet Propulsion Laboratory*

### Intensive Care on the Cloud

CuraSigna in Bangalore, India, licensed and integrated NASA’s VITAL ventilator design into a medical technology ecosystem for performing “virtual rounds” at intensive care units.

*CuraSigna, Jet Propulsion Laboratory*





# Space Robotics Take a Deep Dive

**Aquanaut, built on lessons from NASA's robot astronaut, will cut costs for ocean industries**

Many of the engineers at Houston's Nauticus Robotics built NASA robots, such as Robonaut 2, designed to operate in harsh, remote environments. Now they've applied that knowledge to an underwater robot that can carry out offshore operations with minimal support.

*Nauticus Robotics, Johnson Space Center*



# NASA Helps Serve Yellowstone Fungi for Breakfast

**An organism found in the park is a sustainable protein on Earth and in space**

A microbe found in Yellowstone National Park during NASA-funded research is now the basis of a fungal protein from which Chicago-based Nature's Fynd produces meat-alternative breakfast patties and non-dairy cream cheese.

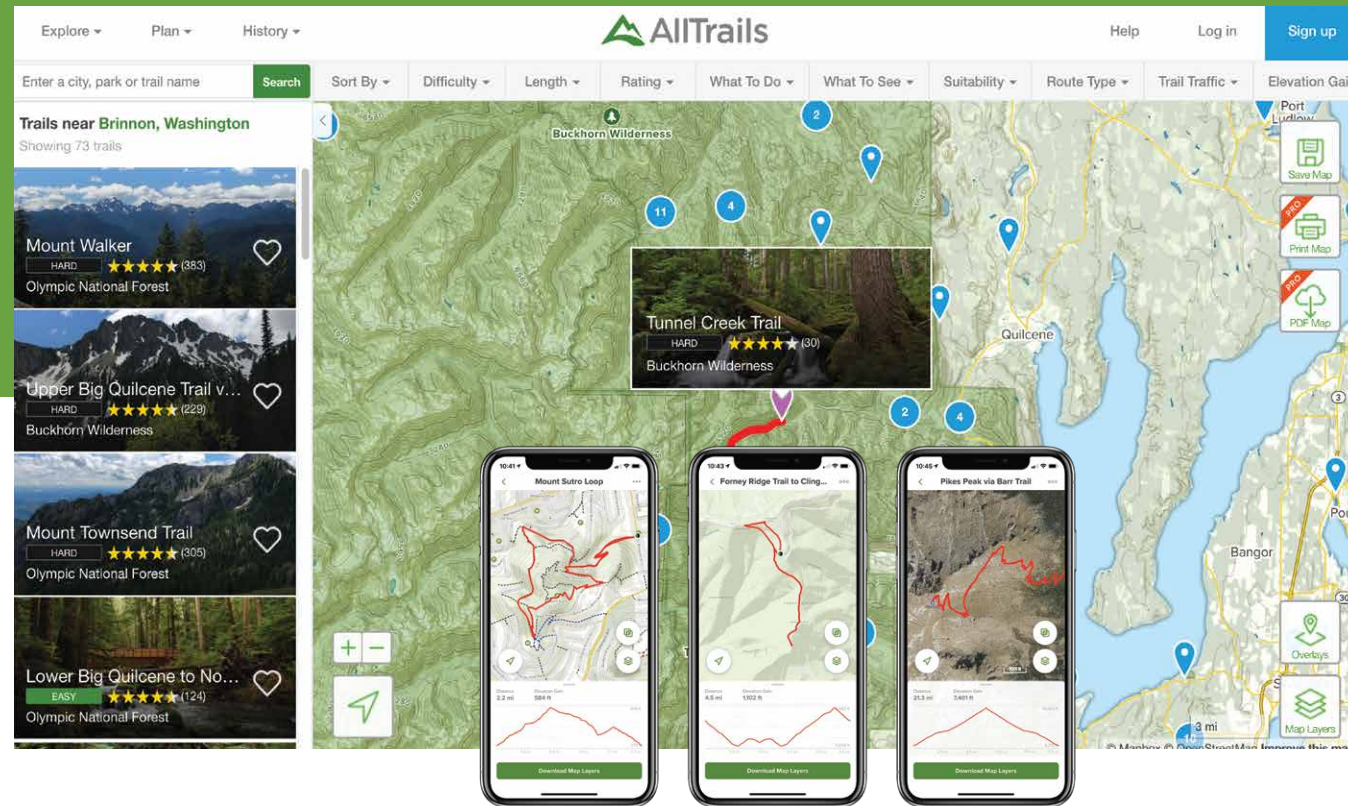
*Nature's Fynd, NASA Headquarters*





# The View from Space Keeps Getting Better

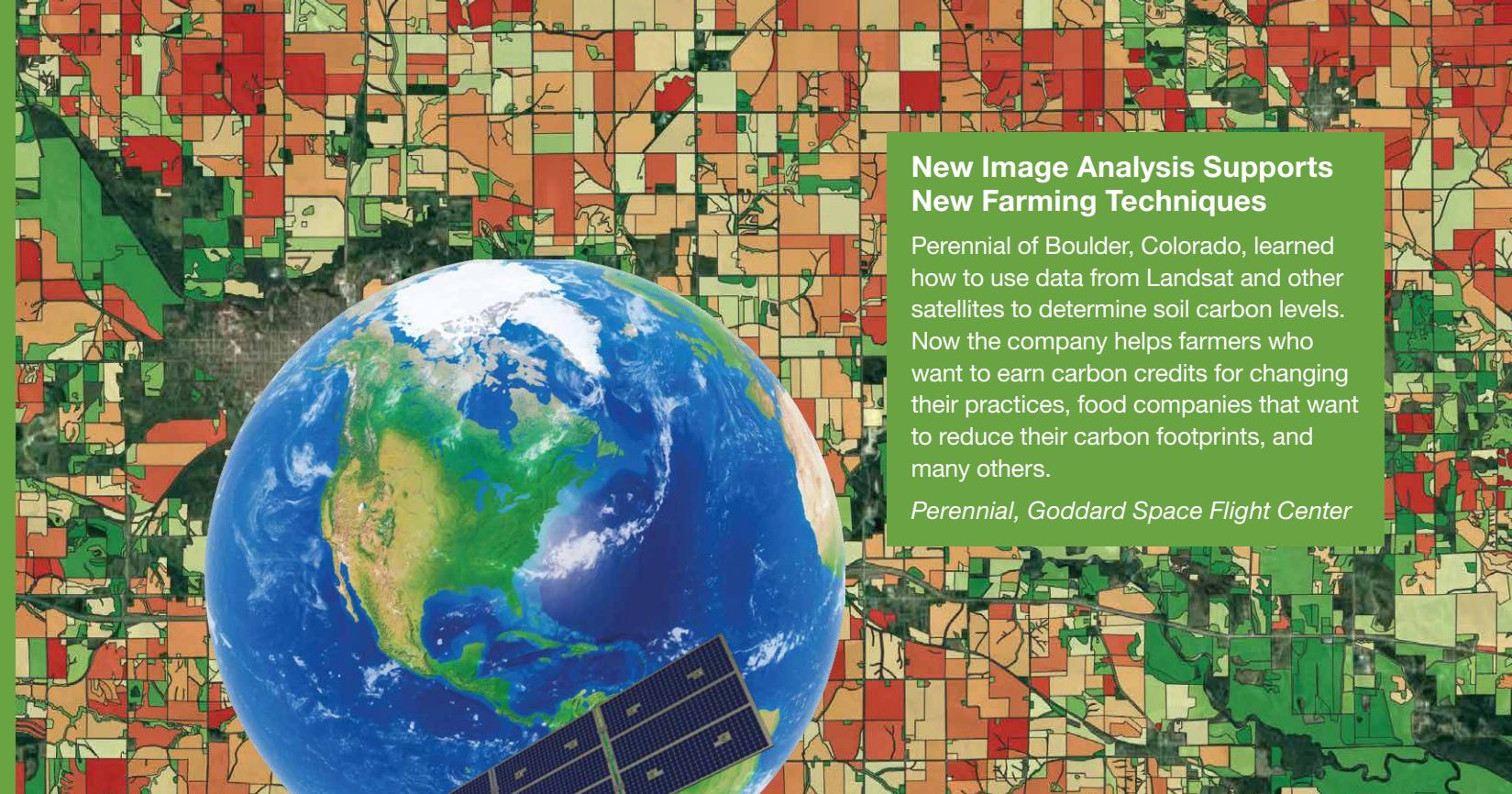
After 50 years of Landsat, discovery of new commercial and scientific uses is only accelerating



## New Image Analysis Supports New Farming Techniques

Perennial of Boulder, Colorado, learned how to use data from Landsat and other satellites to determine soil carbon levels. Now the company helps farmers who want to earn carbon credits for changing their practices, food companies that want to reduce their carbon footprints, and many others.

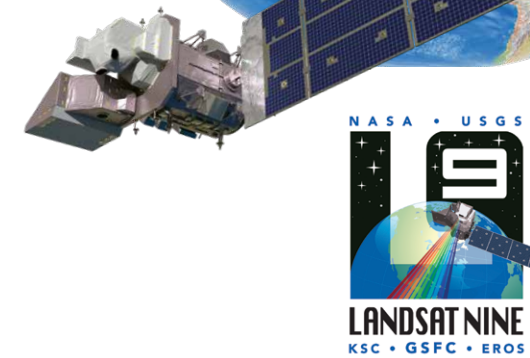
*Perennial, Goddard Space Flight Center*



## Pulling Moisture Data from the Air

Situated in the river delta that supplies most of California's freshwater, Brett Baker's family pear farm in Sacramento County is required to monitor its water use. It was impossible to get useful data, though, until the release of OpenET, a platform that uses Landsat data to calculate evapotranspiration.

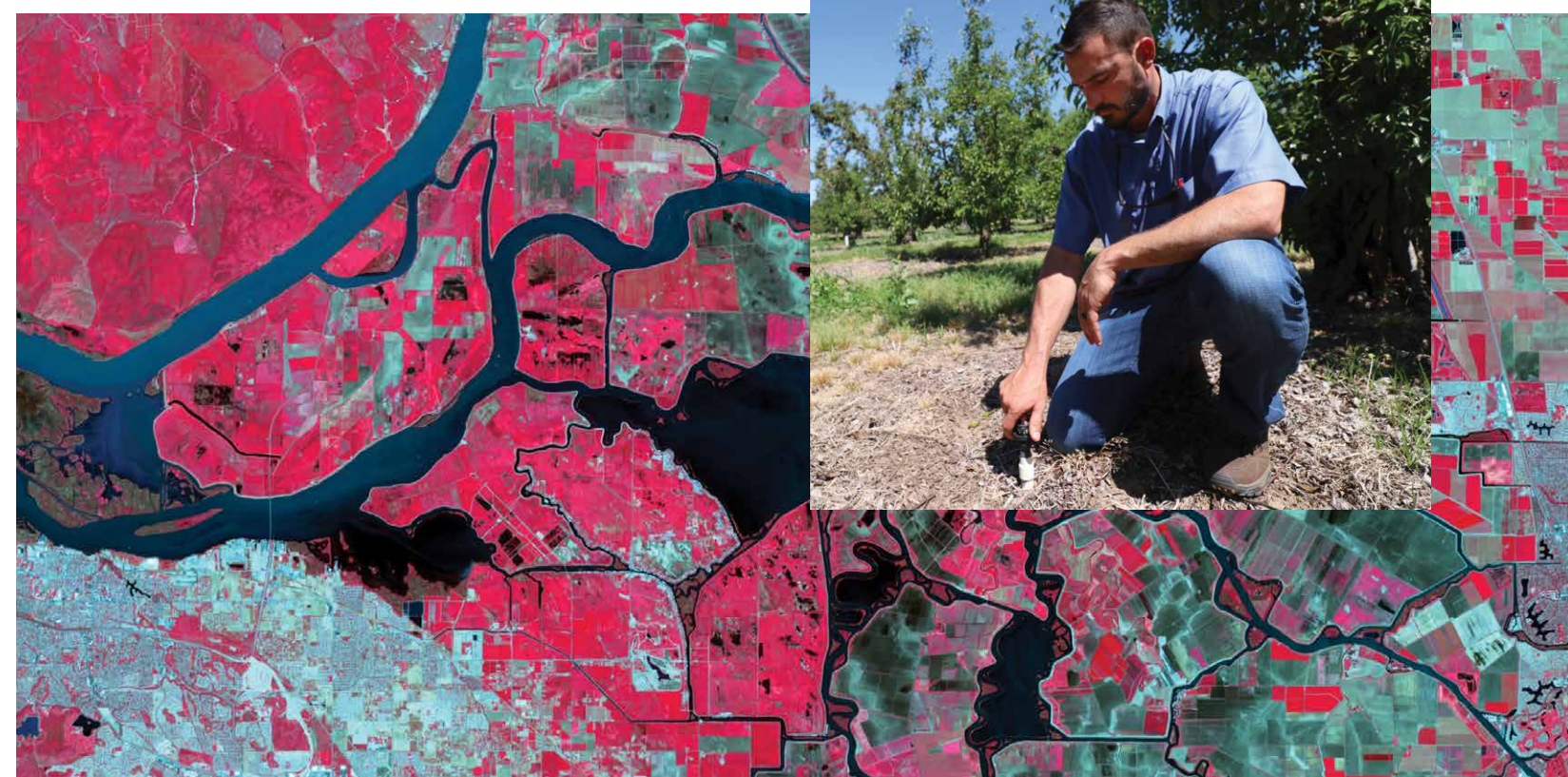
*Baker Family Farm, Goddard Space Flight Center*



## Landsat Maps a Path for Companies

When it started, Mapbox of Washington, D.C., relied on Landsat to build images of the planet. Today, Mapbox, which provides a platform and data for developers to build map-based applications, is a \$1 billion company with dozens of household names among its customers.

*Mapbox, Goddard Space Flight Center*





# Space Radiation Research Fights Cancer on Earth

Research into a novel method for detecting molecular damage in astronaut DNA led to a new cancer test

NASA-funded research found that certain segments of DNA can be used to measure the radiation damage astronauts experience while in space. Fitchburg, Wisconsin-based Promega used the technique to create OncoMate MSI Dx Analysis System, a diagnostic test that helps customize cancer treatment.

*Promega, Johnson Space Center*



# SPINOFF Capsules

NASA works continually to uncover mysteries of the universe, and many of its innovations have been adapted to benefit all of us. Read on for additional examples. For more, visit [spinoff.nasa.gov](http://spinoff.nasa.gov)

## Telescope Mirror Tech Improves Eye Surgery

Technology to measure Webb mirrors boosts LASIK eye surgery precision



Early work on the James Webb Space Telescope mirrors led to improvements in eye-mapping software that were incorporated into a system for guiding LASIK eye surgery that is now sold by Johnson & Johnson Vision of Santa Ana, California.

*Johnson & Johnson, Goddard Space Flight Center*





# Learning to Code with NASA Data

Microsoft uses info and expertise from NASA to build STEM education lessons



Under a Space Act Agreement, Microsoft of Redmond, Washington, collaborated with NASA's Office of STEM Engagement to use NASA data and imagery in programming teaching materials.

*Microsoft, NASA Headquarters*

# Feeling Hot, Staying Cool

NASA-funded technology helps relieve symptoms of menopause



Using a temperature-controlling material developed in part under a NASA SBIR contract for spacesuit gloves, Fifty One of London is making clothes to alleviate the symptoms of menopause.

*Fifty One,  
Johnson Space Center*



# Space Program Pumps Up Turbomachinery

NASA helped make turbopump advances still used in aerospace and energy



When NASA was looking for a low-cost solution to launch into orbit, Barber-Nichols of Arvada, Colorado, was subcontracted to build the turbopump for the Fastrac rocket engine. Using lessons learned from this program, the company now produces similar turbomachinery for commercial rockets and other applications on the ground.

*Barber-Nichols, Marshall Space Flight Center*

# Astronaut Life Support for Earth Families

Grow towers for crops and seafood will soon drive self-sustaining shelters

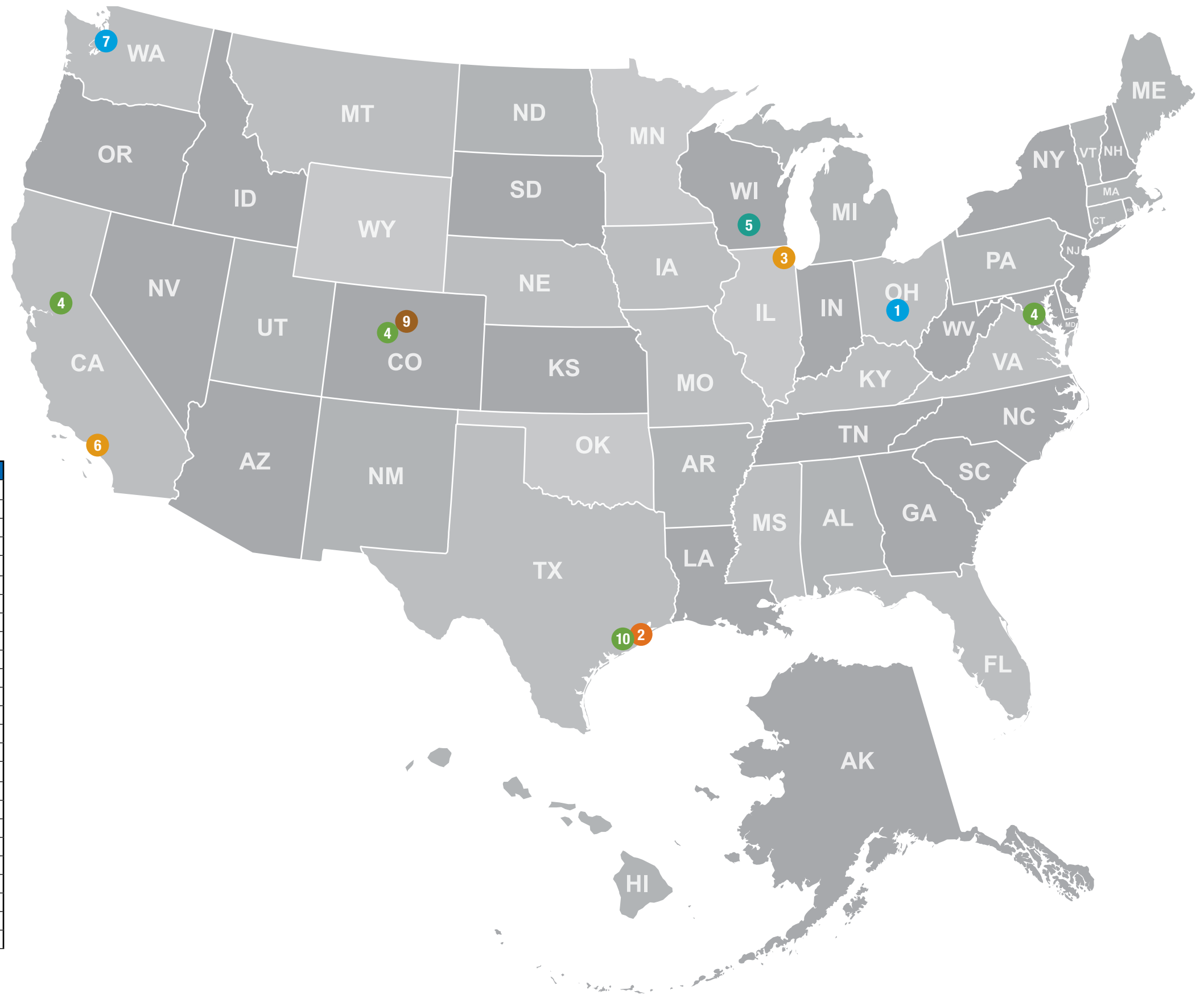


Eden Grow Systems of Houston built on decades of published NASA research and the expertise of a former NASA plant scientist to create automated, energy-efficient, aeroponic towers for growing crops and seafood.

*Eden Grow Systems,  
Kennedy Space Center*



# NASA SPACE TECH WHERE YOU LIVE



Article/Technology	Company, Location
1 NASA's VITAL Contribution to Global Pandemic Relief  Low-cost respiratory ventilators	Bharat Forge, Pune, India
	CuraSigna Systems, Bangalore, India
	Russer Brasil, Indaiatuba, Brazil
	STARK Industries, Columbus, OH
2 <b>Space Robotics Take a Deep Dive</b> Aquanaut autonomous underwater robot	Nauticus Robotics, Houston, TX
3 <b>NASA Helps Serve Yellowstone Fungi for Breakfast</b> Fy meat-alternative protein	Nature's Fynd, Chicago, IL
4 <b>The View from Space Keeps Getting Better</b>  Landsat Earth-imaging data and data-analysis tools	Mapbox, Washington, DC
	Perennial, Boulder, CO
	Baker Family Farm, Sacramento County, CA
5 <b>Space Radiation Research Fights Cancer on Earth</b> Diagnostic test to customize cancer treatment	Promega, Fitchburg, WI
6 <b>Telescope Mirror Tech Improves Eye Surgery</b> System for guiding LASIK eye surgery	Johnson & Johnson, Santa Ana, CA
7 <b>Learning to Code with NASA Data</b> Data for computer science/programming lessons	Microsoft, Redmond, WA
8 <b>Feeling Hot, Staying Cool</b> Temperature-controlling clothing for menopause	Fifty One, London, England
9 <b>Space Program Pumps Up Turbomachinery</b> Turbopump machinery	Barber-Nichols, Arvada, CO
10 <b>Astronaut Life Support for Earth Families</b> Aeroponic tower for growing crops, seafood	Eden Grow Systems, Houston, TX



# Spinoffs of Tomorrow

Each year, we document dozens of spinoff success stories, but the work of the Technology Transfer program is ongoing. Our technology portfolio contains many exciting innovations ready for an enterprising company or entrepreneur to license and develop into a commercial product.

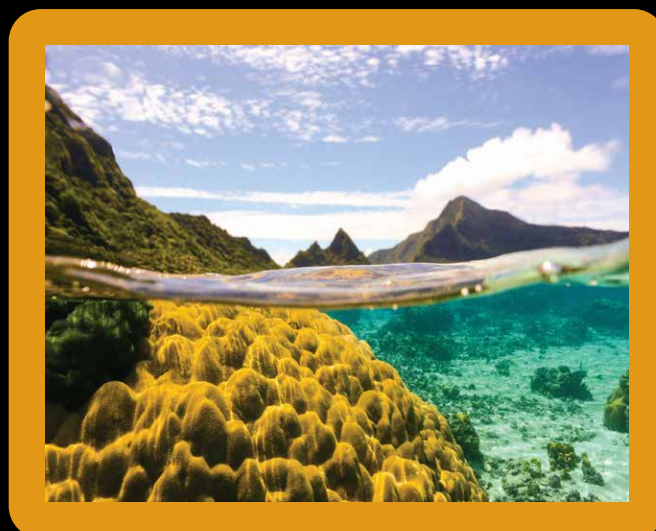
Here are two examples that we think show great promise.

To learn more about – and get started licensing – these or any of the others in our extensive portfolio, please visit [technology.nasa.gov](https://technology.nasa.gov).

## Fluid Lensing System

**Sensing technologies for seeing through waves to explore ocean worlds**

Few remote sensing technologies can capture images of underwater objects well due to surface wave and light distortion. This means the ability to accurately assess shallow marine ecosystems, like coral reefs, is severely impaired. To combat this, innovators at Ames Research Center developed a technology capable of seeing clearly through ocean waves in 3D. The technology removes optical distortions to enhance otherwise underpowered optical systems.



# Will the next spinoff be yours?

Our technology is ready for you at [technology.nasa.gov](https://technology.nasa.gov)

Our portfolio includes:

- More than 1,200 patented technologies
- Hundreds of innovations now in the public domain
- More than 700 software codes

Whether you're looking to start a new company using NASA technology, enhance an existing product, or create a new product line, you can gain a competitive edge in the marketplace by putting NASA technology to work for you.



Aerospace



Communications



Electrical



Environment



Medicine/Biotech



IT/Software



Instrumentation



Manufacturing



Materials/  
Coatings



Mechanical/  
Fluid Systems



Optics



Power Generation



Propulsion



Robotics



Sensors



## Wind Event Warning System

**Doppler lidar alerts to protect wind turbines, aircraft**

Unexpected wind gusts, microbursts, or storms can cause serious damage to wind turbines and aircraft. To stay on guard, innovators at Langley Research Center have developed an early warning system using Doppler lidar that can predict wind events up to 10 minutes away. This is often enough time to take measures to prevent damage, such as rolling aircraft into hangars or ramping down wind turbine rotors so they don't exceed maximum speed limits.



BRINGING NASA TECHNOLOGY DOWN TO EARTH