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May 24, 2021

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NASA's Technology Transfer Program

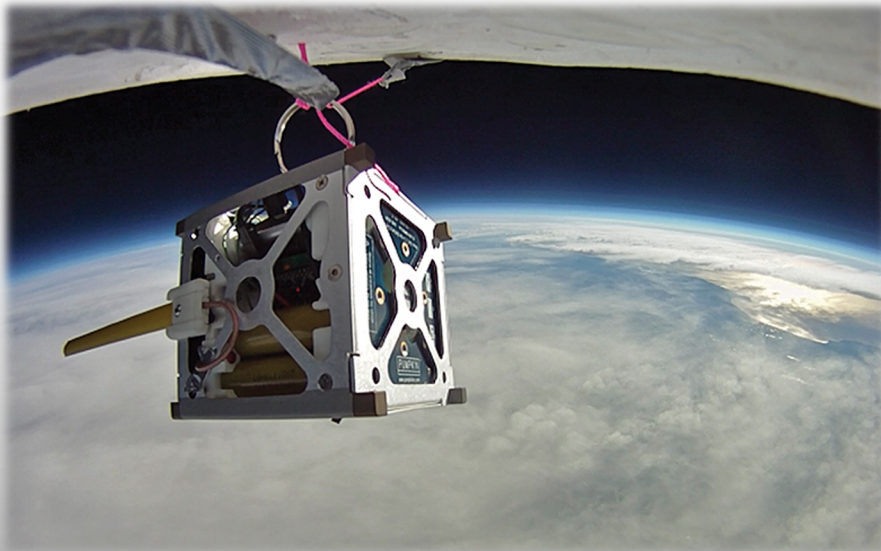


Since its inception over 50 years ago, NASA's Technology Transfer Program ensures that innovations developed for exploration and discovery are broadly available to the public, maximizing the benefit to the Nation.

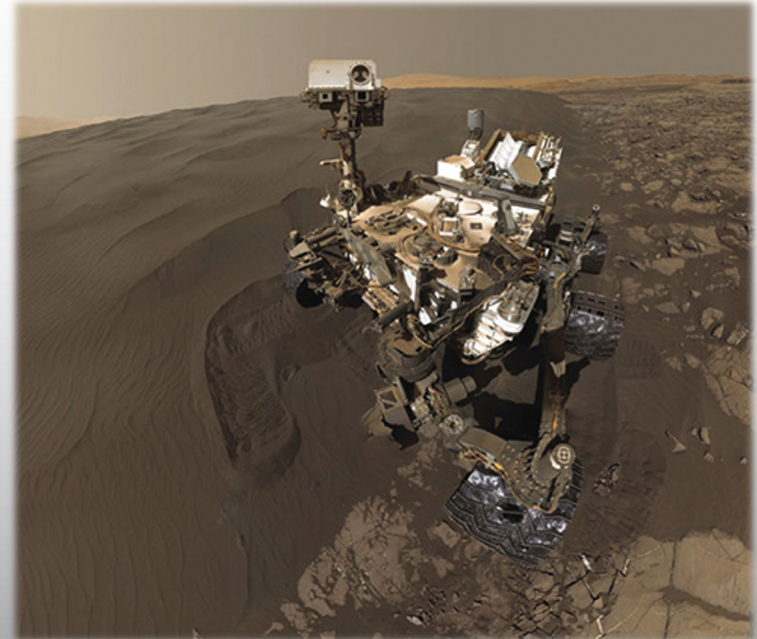
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Mineral Analyzer Shakes Answers Out of Soil and Rocks



Patent Portfolio

Search for a technology in the search bar using descriptive keywords, or simply click on the NASA Patent Portfolio.

Patent Portfolio...

Browse 15 category areas
of licensable technologies.




TOP Number	Title	TOP Category	Website
TOP2-162	Transformable Hypersonic Aerodynamic Decelerator	Aeronautics	https://technology.nasa.gov/patent/TOP2-162
TOP2-165	Nanosatellite Launch Adapter System	Aeronautics	https://technology.nasa.gov/patent/TOP2-165
TOP2-274	Affordable Vehicle Avionics (AVA)	Aeronautics	https://technology.nasa.gov/patent/TOP2-274
TOP2-253	Heterogeneous Spacecraft Networks	Communications	https://technology.nasa.gov/patent/TOP2-253
TOP2-248	Space Optical Communications Using Laser Beams	Communications	https://technology.nasa.gov/patent/TOP2-248
TOP2-287	Fine-pointing Optical Communication System Using Laser Arrays	Communications	https://technology.nasa.gov/patent/TOP2-287
TOP2-167	Woven Thermal Protection System	Manufacturing	https://technology.nasa.gov/patent/TOP2-167
TOP2-262	Multispectral Imaging, Detection, and Active Reflectance (MiDAR)	Optics	https://technology.nasa.gov/patent/TOP2-262
TOP2-284	Fluid Lensing System for Imaging Underwater Environments	Optics	https://technology.nasa.gov/patent/TOP2-284
TOP2-213	Monitoring and Control of Each Nanosatellite within a Cluster of Nanosatellites	Robotics, Automation and Control	https://technology.nasa.gov/patent/TOP2-213
TOP2-265	Low Cost Star Tracker Software	Robotics, Automation and Control	https://technology.nasa.gov/patent/TOP2-265
TOP2-267	Cost Optimized Test of Spacecraft Avionics and Technologies(COTSAT) Modular Spacecraft Software Architecture	Robotics, Automation and Control	https://technology.nasa.gov/patent/TOP2-267
















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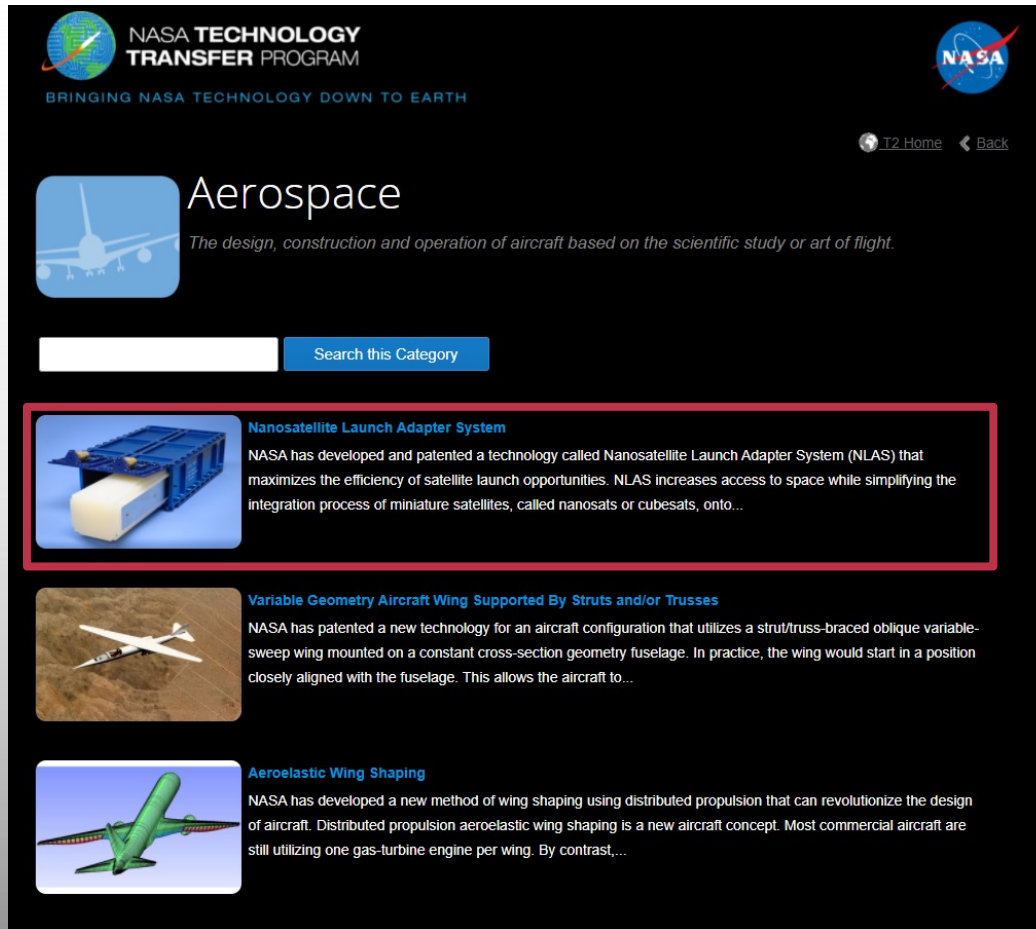
NASA maintains a portfolio of patents with commercial potential and makes them available to the public through our patent licensing program. Whether you're looking to start a new company using NASA technology, enhance an existing product, or create a new product line, you can gain a competitive edge in the marketplace by putting NASA technology to work for you. Click on each of the category icons for a list of patents in that category or use the search below to explore NASA's patent portfolio.

 Aeronautics	 Communications	 Electrical/ Electronics	 Environment	 Health, Medicine, and Biotechnology
 IT and Software	 Instrumentation	 Manufacturing	 Materials and Coatings	 Mechanical and Fluid Systems
 Optics	 Power Generation and Storage	 Propulsion	 Robotics, Automation and Control	 Sensors



Let's explore the **Aeronautics/Aerospace** category

Patent Portfolio... Searching technologies



The screenshot shows the NASA Technology Transfer Program website interface. At the top, the NASA logo and the text "NASA TECHNOLOGY TRANSFER PROGRAM" and "BRINGING NASA TECHNOLOGY DOWN TO EARTH" are visible. A search bar is present with a "Search this Category" button. Below the search bar, three technology results are listed under the "Aerospace" category. The first result, "Nanosatellite Launch Adapter System", is highlighted with a red border. The second result is "Variable Geometry Aircraft Wing Supported By Struts and/or Trusses", and the third is "Aeroelastic Wing Shaping".

NASA TECHNOLOGY TRANSFER PROGRAM
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Aerospace
The design, construction and operation of aircraft based on the scientific study or art of flight.

[Search this Category](#)

Nanosatellite Launch Adapter System
NASA has developed and patented a technology called Nanosatellite Launch Adapter System (NLAS) that maximizes the efficiency of satellite launch opportunities. NLAS increases access to space while simplifying the integration process of miniature satellites, called nanosats or cubesats, onto...

Variable Geometry Aircraft Wing Supported By Struts and/or Trusses
NASA has patented a new technology for an aircraft configuration that utilizes a strut/truss-braced oblique variable-sweep wing mounted on a constant cross-section geometry fuselage. In practice, the wing would start in a position closely aligned with the fuselage. This allows the aircraft to...

Aeroelastic Wing Shaping
NASA has developed a new method of wing shaping using distributed propulsion that can revolutionize the design of aircraft. Distributed propulsion aeroelastic wing shaping is a new aircraft concept. Most commercial aircraft are still utilizing one gas-turbine engine per wing. By contrast,...

As you can see, there will be many results in the categories you chose. We'll click on one technology to show the content.

Have questions about the technology?
Click the link to contact us.



Nanosatellite Launch Adapter System
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Benefits

- Utilizes unused launch vehicle mass and fairing volume
- User configurable deployment ejection timing sequences
- Up to 54kg/24U capacity
- Compatible with standard launch vehicle interfaces
- Internally powered
- P-POD compatible
- Reduced integration time and cost

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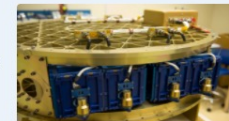


Applications

- Cubesats
- Launch vehicles
- Secondary payloads
- P-PODs
- Nanosatellites
- Actuator Management
- Sequencing
- Multi-spacecraft missions
- Constellation spacecraft
- Deployers

The Technology

NLAS consists of three configurable subsystems to meet the needs of a multi-spacecraft launch. The Adapter is the primary structure that provides volume for secondary payloads between the rocket and the primary spacecraft. The Adapter takes advantage of the frequently unused volume within the rocket fairing. It fits up to 4 NLAS Dispenser units, or 8 eight Poly-PicoSatellite Orbital Deployers (P-PODs), or any combination thereof. The NLAS Dispenser is reconfigurable to support either two 3U bays or a single 6U bay and is compatible with 1U, 1.5U, 2U, 3U, and 6U satellites. The Dispenser system is the first 6U deployment system backwards compatible to 3U spacecraft. Finally, the NLAS deployment Sequencer is an internally powered subsystem which accepts an initiation signal from the launch vehicle and manages the actuations for each deployment device per a user programmable time sequence. It is programmed using ground support equipment (GSE) and a simple graphical user interface (GUI) on a computer.



NLAS Combined System

[Download a PDF fact sheet for this technology.](#)

Details

Category	Aerospace
Reference Number	TOP2-165
Case Number(s)	ARC-16732-1 ARC-16732-2
Patent(s)	9,994,336



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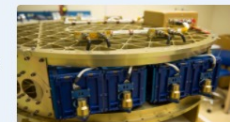
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Patent number hyperlinks to USPTO site.

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(1 of 1)

United States Patent
Ghassemieh, et al.

9,994,336
June 12, 2018

System and methods for deploying payloads

Abstract

Embodiments of the present invention include systems for launching primary or secondary payloads or actuating other launch vehicle or payload or instrumentation device. The system includes an adapter assembly and at least one sequencer mounted to the adapter assembly. The sequencer includes: controller boards, each of the controller boards having a controller for controlling deployment of the payloads and data files; output ports coupled to the controller boards and configured to transmit signals from the controller boards to dispensers therethrough, deployment mechanisms containing the payloads, the adapter assembly having channels for accommodating the dispensers; and a detector coupled to the controller boards and adapted to detect an external signal and, in response to the external signal, to send an initiation signal to the controller boards. The system also includes at least one power supply coupled to the sequencer and adapted to provide an electrical power to the sequencer.

Inventors: Ghassemieh; Shakib M. (Santa Clara, CA), Ricks; Robert D. (Newark, CA), Friedericks; Charles R. (San Jose, CA), Mai; Nghia (San Jose, CA), Hines; John W. (Sunnyvale, CA), Brownston; Lee S. (Palo Alto, CA), Ross; Shannon S. (Campbell, CA)

Applicant: Name City State Country Type

The United States of America as Represented by the Administrator of the National Aeronautics & Space Administration (NASA) Washington DC US

Assignee: The United States of America as Represented by the Administrator of NASA (Washington, DC)

Family ID: 62485814

Appl. No.: 13/573,924

Filed: March 14, 2013

It's important to review patent information and all claims to be sure the technology meet your needs.

Claims

What is claimed is:

1. A sequencer for deploying one or more payloads, comprising: a plurality of controller boards, each of the controller boards having a controller for controlling deployment of payloads and a plurality of data files, a power supply coupled to the plurality of controller boards and adapted to provide an electrical power to the plurality of controller boards, a plurality of output ports coupled to the plurality of controller boards and configured to transmit signals from the plurality of controller boards to dispensers containing the payloads and data files, a detector coupled to the plurality of controller boards and adapted to detect an external signal and, in response to the external signal, to send an initiation signal to the plurality of controller boards, and a connection port for connecting a plurality of sequencers together in a daisy chain, wherein the detector of the sequencer is adapted to send the initiation signal to the plurality of sequencers, and wherein one controller is able to check integrity of a data file of the plurality of data files and the other controller is able to check integrity of an identical data file and wherein at least one controller is able to halt controlling the deployment of the payloads when a mismatch between the data file checked by one controller and the data file checked by the other controller is detected.
2. A sequencer for deploying one or more payloads, comprising: a plurality of controller boards, each of the controller boards having a controller for controlling deployment of payloads and a plurality of data files, a power supply coupled to the plurality of controller boards and adapted to provide an electrical power to the plurality of controller boards, a plurality of output ports coupled to the plurality of controller boards and configured to transmit signals from the plurality of controller boards to dispensers containing the payloads and data files, a detector coupled to the plurality of controller boards and adapted to detect an external signal and, in response to the external signal, to send an initiation signal to the plurality of controller boards, and a connection port for connecting a plurality of sequencers together in a daisy chain, wherein the detector of the sequencer is adapted to send the initiation signal to the plurality of sequencers, wherein the controller boards include electronics which consume less than 500 mW at their quiescent state, and wherein the power supply includes at least one of a battery pack, a bank of capacitors, and a combination thereof and wherein the power supply activates deployment of the payloads and is electrically isolated from the launch vehicle.
3. A sequencer as recited in claim 2, wherein the detector is adapted to detect a light emitted from an opto-isolator powered by a launch vehicle and wherein the opto-isolator is activated by a launch vehicle that carries the sequencer, wherein the detector of the sequencer is electrically isolated from the opto-isolator of the launch vehicle.
4. A sequencer as recited in claim 2, wherein the detector is configured to detect light emitted from the opto-isolator powered in a range of voltages, 5V to 60V depending of the power system of a launch vehicle that carries the sequencer.
5. A sequencer as recited in claim 2, further comprising: a first oscillator for providing a first system clock signal at a first frequency, the first oscillator performing schedule services while the sequencer is asleep; and a second oscillator for providing a second system clock signal at a second frequency, the second oscillator performing navigation processing while the sequencer is awake, wherein the first frequency is lower than the second frequency; and the controller uses the first system clock signal until the initiation signal is received to thereby minimize consumption of the electrical power.

Description

BACKGROUND OF INVENTION

A. Technical Field

The present invention relates to spacecraft launch systems, more particularly, to systems for launching payloads.

B. Description of the Prior Art

Access to space has continually been an area of concern for a number of space agencies, both in terms of numbers of launch opportunities and costs associated with space lift. Traditional launch campaigns tend to be unique and require a significant amount of engineering engineering response, maintaining a high one-time structure. One conventional innovation surrounds the emergence of spin-on launch vehicles in the space lift marketplace. Relatively new entrants and existing companies are making significant inroads into the cost component associated with launch vehicle production and operation. There are other companies in earlier stages of development that also may potentially add to this equation.

For the past 5 to 6 years, the willpower and ability of major launch programs to accommodate smaller platforms as ridealights stimulated an emerging small-launch spacecraft market, attracting high-level interest from both the scientific and operational space communities. The small satellite community has greatly increased in size over the last decades, creating a need for a system that can most efficiently use the space available on launch vehicles.

The sharing of launch vehicles has some unique characteristics that need to be addressed in the hardware development. The most important consideration needs to be in protecting the primary spacecraft that the rocket (or, equivalently, launch vehicle) is being used for. This means that both for integration and during spacecraft operation, the secondary payload systems need to be completely independent and have numerous safeguards in place to ensure that no adverse circumstances are created for the primary spacecraft.

Accordingly, there is a need for improved systems for launching smaller launch systems that are able to protect the primary spacecrafts from additional risks from the non-launching launch and providing consistent deployment of the smallest launch systems.

SUMMARY OF THE INVENTION

In embodiments, a sequencer for deploying payloads includes: controller boards, each of the controller boards having a controller for controlling deployment of the payloads and data files, a power supply coupled to the controller boards and adapted to provide electrical power to the controller boards, output ports coupled to the controller boards and configured to transmit signals from the controller boards to deployment mechanisms or actuating devices containing the payloads therethrough, and a detector coupled to the controller boards and adapted to detect an external signal and, in response to the external signal, to send an initiation signal to the plurality of controller boards.

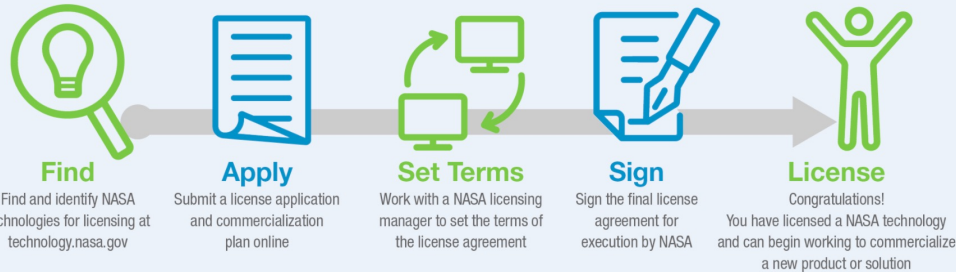
In embodiments, a system for launching payloads includes an adapter assembly and at least one sequencer mounted to the adapter assembly. The sequencer includes: controller boards, each of the controller boards having a controller for controlling deployment of the payloads and data files, output ports coupled to the controller boards and configured to transmit signals from the controller boards to deployment mechanisms or actuating devices containing the payloads therethrough, the adapter assembly having channels for accommodating the deployment mechanisms or actuating devices, and a detector coupled to the controller boards and adapted to detect an external signal and, in response to the external signal, to send an initiation signal to the controller boards and adapted to detect an external signal and, in response to the external signal, to send an initiation signal to the controller boards. The system also includes at least one power supply contained in the sequencer and adapted to provide electrical power to the sequencer.

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How to License NASA Technology



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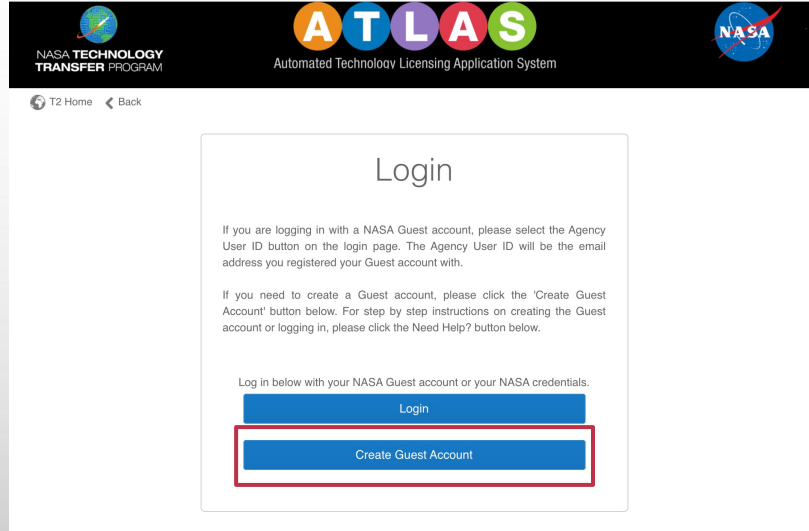
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Benefits

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- User configurable deployment ejection timing sequences
- Up to 54kg/24U capacity
- Compatible with standard launch vehicle interfaces
- Internally powered
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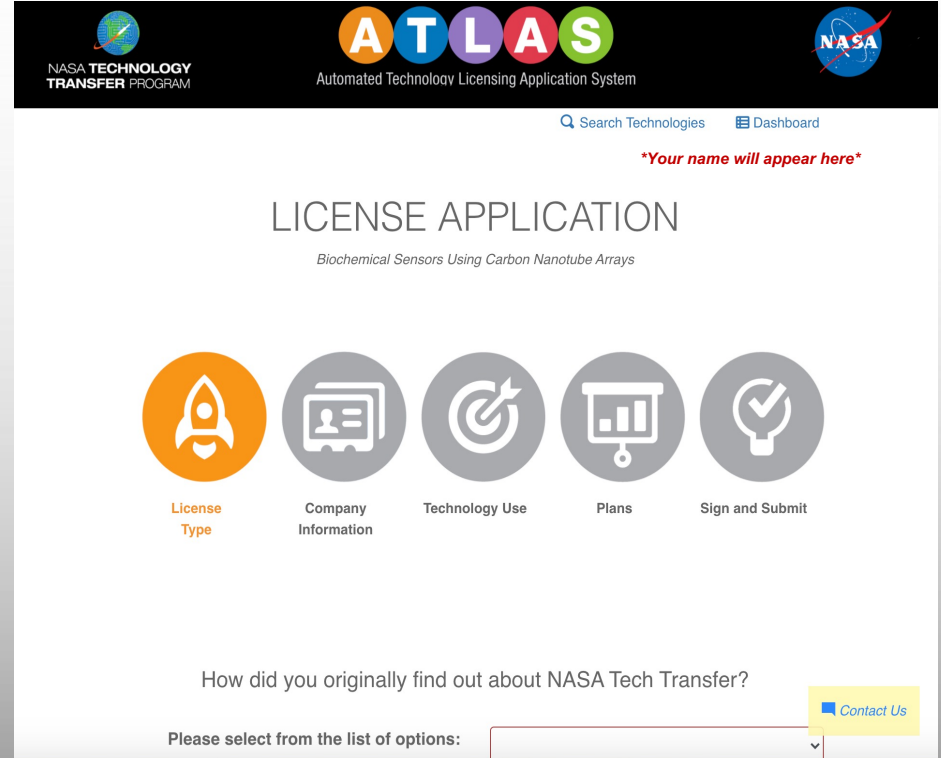
Applying for a License...application process

Create a Guest Account, if you do not have one yet.



The screenshot shows the ATLAS (Automated Technology Licensing Application System) login page. At the top, there is a navigation bar with the NASA Technology Transfer Program logo, the ATLAS acronym, and the NASA logo. Below the navigation bar, there is a "Login" section with instructions for logging in with a NASA Guest account or creating a new one. Two buttons are visible: "Login" and "Create Guest Account". The "Create Guest Account" button is highlighted with a red rectangular border.

Once your account is created, the license application page should open. The **first step is selecting License Type.**



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Commercial

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The last few questions on the first section (below) of the application will determine your license type (Startup, Evaluation, Commercial). **Before you advance to the next section, check the bottom of the page to confirm that your intended license type is listed.**

Complete the rest of the application **with as much detail as possible**. Click “submit” on the last page and be sure to **complete the Adobe e-signature process** that follows.

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How do you intend to use the technology? I want to develop a new product or service
 I want to enhance an existing product or service
 I'd like to evaluate this technology's potential for my company

Is this for a startup company that is yet to be formed or which formed within the last 24 months? (Why is this important?) Yes
 No

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Release Types

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- General Purpose
 - U.S. Only
 - U.S. and Foreign
 - Public

**All, but Open Source require a Software Usage Agreement (SUA); apply for free, online.*

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- business systems and project management
- design and integration tools
- propulsion
- data and image processing
- environmental science
- system testing
- vehicle management
- structures and mechanisms
- materials and processes
- autonomous systems
- operations
- data servers processing and handling
- crew and life support
- electronics and electrical power
- aeronautics

TOP Number	Title	TOP Category	Website
TOP2-162	Transformable Hypersonic Aerodynamic Decelerator	Aeronautics	https://technology.nasa.gov/patent/TOP2-162
TOP2-165	Nanosatellite Launch Adapter System	Aeronautics	https://technology.nasa.gov/patent/TOP2-165
TOP2-274	Affordable Vehicle Avionics (AVA)	Aeronautics	https://technology.nasa.gov/patent/TOP2-274
TOP2-253	Heterogeneous Spacecraft Networks	Communications	https://technology.nasa.gov/patent/TOP2-253
TOP2-248	Space Optical Communications Using Laser Beams	Communications	https://technology.nasa.gov/patent/TOP2-248
TOP2-287	Fine-pointing Optical Communication System Using Laser Arrays	Communications	https://technology.nasa.gov/patent/TOP2-287
TOP2-167	Woven Thermal Protection System	Manufacturing	https://technology.nasa.gov/patent/TOP2-167
TOP2-262	Multispectral Imaging, Detection, and Active Reflectance (MiDAR)	Optics	https://technology.nasa.gov/patent/TOP2-262
TOP2-284	Fluid Lensing System for Imaging Underwater Environments	Optics	https://technology.nasa.gov/patent/TOP2-284
TOP2-213	Monitoring and Control of Each Nanosatellite within a Cluster of Nanosatellites	Robotics, Automation and Control	https://technology.nasa.gov/patent/TOP2-213
TOP2-265	Low Cost Star Tracker Software	Robotics, Automation and Control	https://technology.nasa.gov/patent/TOP2-265
TOP2-267	Cost Optimized Test of Spacecraft Avionics and Technologies(COTSAT) Modular Spacecraft Software Architecture	Robotics, Automation and Control	https://technology.nasa.gov/patent/TOP2-267

Technology Transfer Program Overview - <https://technology.nasa.gov/>

How to License Technology - <https://technology.nasa.gov/license>

NASA Patents - <https://technology.nasa.gov/patents>

Free Software - <https://software.nasa.gov/>

SBIR/STTR - <https://sbir.nasa.gov/>

Success Stories - <https://spinoff.nasa.gov/>

NASA Home and City - <https://homeandcity.nasa.gov/>

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What is left “undone” in your company that you might search
NASA technology for a solution?

