Instaclave Technologies Inc.

“Carbon Fiber manufacturing is a Craft, We are making it a Science”

Caldera Lamination System

Revolutionizing and disrupting Composite Materials by redesigning the chemistry and geometry of existing solution .

These new materials open new markets, enables accessible solutions for designers, and creates a new fabrication technique enabling On-Site Self-Assembly of complex structures from micro to macro.

www.instaclave.com

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How are we going to build structures in Space?

The International Space Station (ISS) is made up of dozens of module's that have been put together piece meal as part of an international collaboration.

Every part of the ISS has been launched into space at the estimated cost of $10,000 per pound, using chemical rockets.

Parts not delivered by chemical rockets directly have had to fit in the payload bay of the now retired Space Shuttle, at an estimated cost of $50,000 a pound.

We now have additional problems:
- We have no more Shuttles to deliver components

- Our International collaboration is failing, we are dependent on Russia for all frequent crew manning's, at $76,000,000 a seat to launch.

- Astronauts' space-time is limited due to bone degeneration from lack of gravity and solar radiation. Peak conditions, an astronaut can only last 6 months.

- Limited food and oxygen require frequent launches of supply ships, to date only one American company has made any dockings, SpaceX, and they will not carry Astronauts for another 6 months.

History of Instaclave Technologies

John Steven Calder a seasoned product designer with a 40 year track record of innovation. When asked by an industrial design professor, "How will we build large structures in space?" Calder took on the challenge, reflecting on the problem over the course of 3 years.

Drawing on his experience with multiple design disciplines and processes, he determined that a carbon fiber type structure would be the only material capable of the demands of space and light enough to get into orbit economically. Problem is current carbon fiber and composite solutions did not work. There are no molds, or autoclaves available in space. Instead of determining its not possible, he decided to rethink or disrupt composite material technologies to make his proposed design feasible.

So he invented the solution: the ***Caldera Lamination System*** (***CLS***), or "A means to autoclave carbon fiber structures in a vacuum". Calder's solution uses no molds, no ovens, no vacuums and no autoclaves. Bonding and forming CLS parts happen in seconds instead of hours, reducing fabrication energy expense.

The CLS has been verified as scientifically sound by Instaclave R & D partner, Lawrence Berkeley Labs at UC Berkeley. This business opportunity is the most disruptive and important technology of John's career. A division head of the Lawrence Berkeley National Lab stated that ***CLS*** and the corresponding manufacturing/fabrication technologies are as important and potentially disruptive as the invention of aluminum.

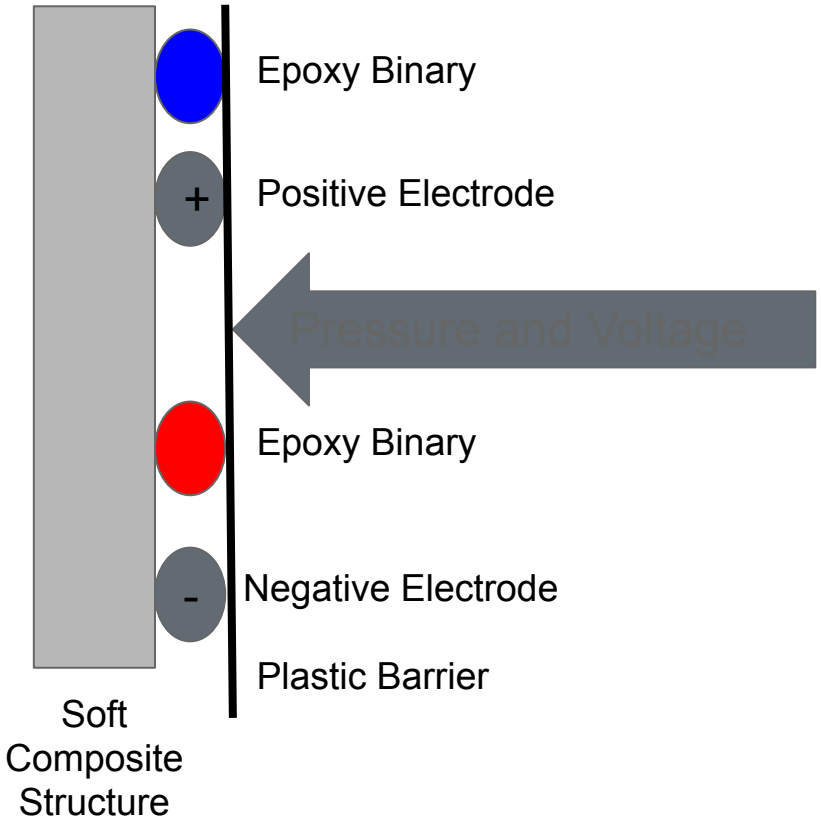
Introducing the *Caldera Lamination System*

- ***It's a New Chemistry*** - The *Caldera Lamination System* composition creates new chemical binders that modify viscosity and temperature ranges.
- ***It's a New Fabrication Process*** - Complex structures can be created with minimal intervention by controlling the pressure between composite structures in multiple stages.
- ***It's Simplicity*** - The component part is *both* the tooling and the mold.
- ***It's a New Material*** - The *Caldera Lamination System* is a new material, a new tool for designers. If you can visualize a project, this technology will allow you to build it.
- ***It's a New Technology*** - *On-Site Self-Assembly & Manufacturing*. By sequencing the *Caldera Lamination System* parts, very massive, very intricate, extremely complex structures can self-form and self-erect. Simple machines can also be created.
- The *Calder Lamination System* is disrupting the Composite materials marketplace.

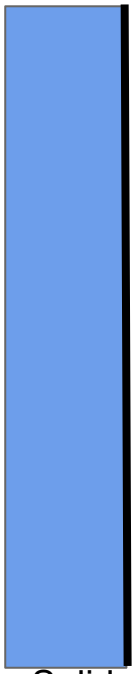
On-Site - Earth (1 atmosphere), Space (<1 atmosphere) under pressure (>1 atmosphere).

The Caldera Lamination System Activation

Pre-bonding



Post-bonding

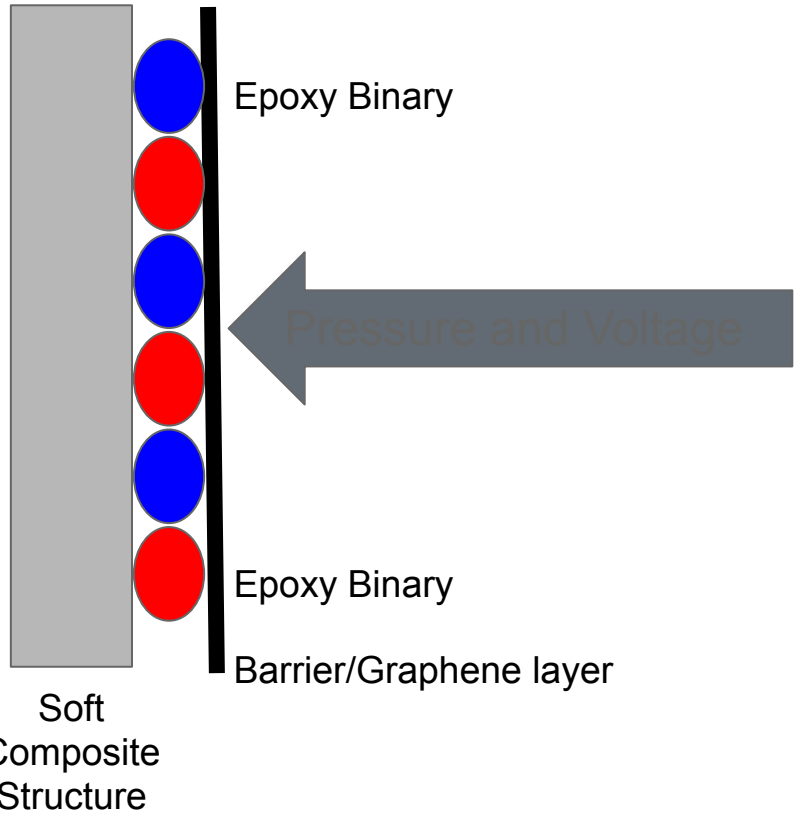


Heating elements liquify epoxy binary compounds. Differential pressure forces mixed binaries into composite mesh. Heating element self destructs, plastic barrier bonds to structure.

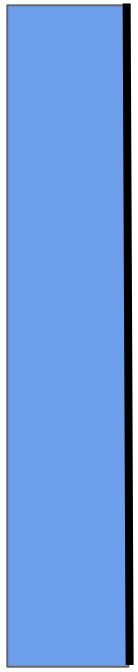
Solid
Composite
Structure

The Caldera Lamination System Activation

Pre-bonding



Post-bonding



Heating elements liquify epoxy binary compounds. Differential pressure forces mixed binaries into composite mesh. Heating element self destructs, graphene barrier bonds to structure.

Solid
Composite
Structure

The Caldera Lamination IP Filings & Claims

Caldera Lamination Differential Pressure Bonding Process

Caldera Lamination Binary Epoxy Flow Control Mechanical Processes

Caldera Lamination Binary Epoxy Flow Control Electrical Processes

Caldera Lamination Binary Epoxy Chemistry

Caldera Lamination System Sequential Bonding Process

Caldera Lamination Controller System

Caldera Lamination Controller Programming System

Caldera Lamination Barrier Layer Composition

Caldera Lamination Barrier Layer Fabrication and Application

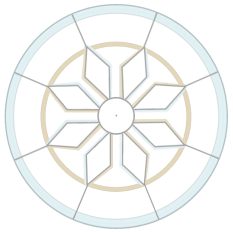
Caldera Lamination Alternative Epoxy Bond Materials

Caldera Lamination System Self-Assembly Design Guidelines

Caldera Lamination System Mixed Material Integration

Caldera Lamination Design Libraries

Caldera Lamination Multi-Vendor Composite Product Selector



The Caldera Lamination System - Control is everything

K_t	-	Thickness of the Composite
G_t	-	Thickness of the Graphene component
K_p	-	Porosity of the Composite mesh component
C_t	-	Thickness/Mass of Caldera Laminate
C_d	-	Density/Mass of Caldera Laminate
V_h/V_l	-	Voltage profile of Caldera Laminate heating element
V_{t1}/V_{tx}	-	Duration of Voltage application
D_{p1}/D_{px}	-	Differential pressure vs time
B_{t1}/B_{tx}	-	Bonding time of epoxy binaries
Gp	-	Gas pressurization profile
Br	-	Ratio of Binder to Composite

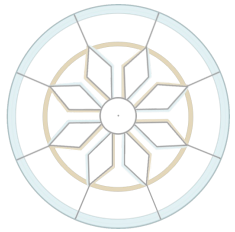
The Calder Lamination System - It's Chemistry

Research must be done to refine the binary binders performance.

- Temperature effects for different applications, ie, Space, Military and Commercial.
- Porosity flow profile based upon atmosphere of use.
- Durability over time for different applications, ie, Space, Military and Commercial.

The Caldera Lamination System - R & D Goals

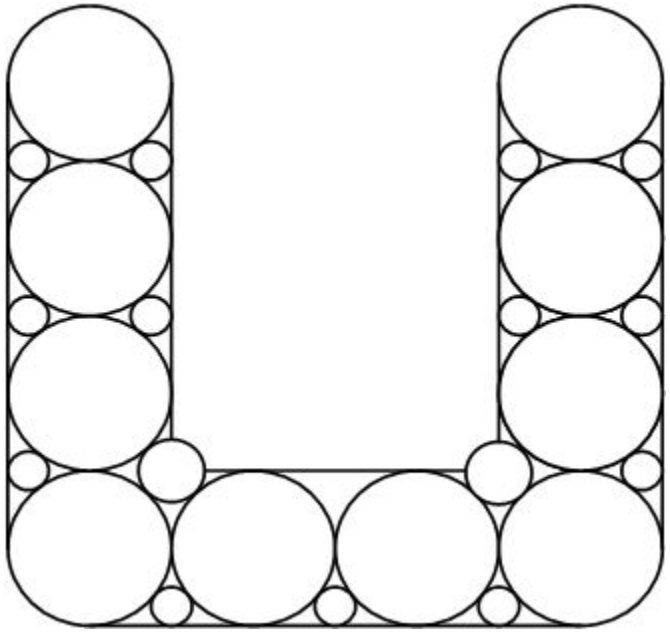
- Development of Ratios/Formulas for application of Caldera Laminate
- Geometry of Caldera Laminate, ie, Flat ribbon or complex matrix?
- Fabrication and application of Caldera Laminate ie, 3D printing?
- Determination of heating element materials.
- Design electrical grid schematics
- Electrical grid attachments and sequencing.
- Heating and flow properties of melted binder.
- Chemistry of binder for multiple applications, ie, Space, Military and commercial partners.



Structural Engineering - R&D Goals

- Define sample applications examples
- Define samples for Space, Military and Commercial partner applications
- Define Design Note Documentation of 3rd party adoption
- Define solution and examples for Caldera Laminate structures, including joinery details ie, overlapping bindings, seam management and complex joint techniques.
- Define techniques for integration of metallic or other structural integrations

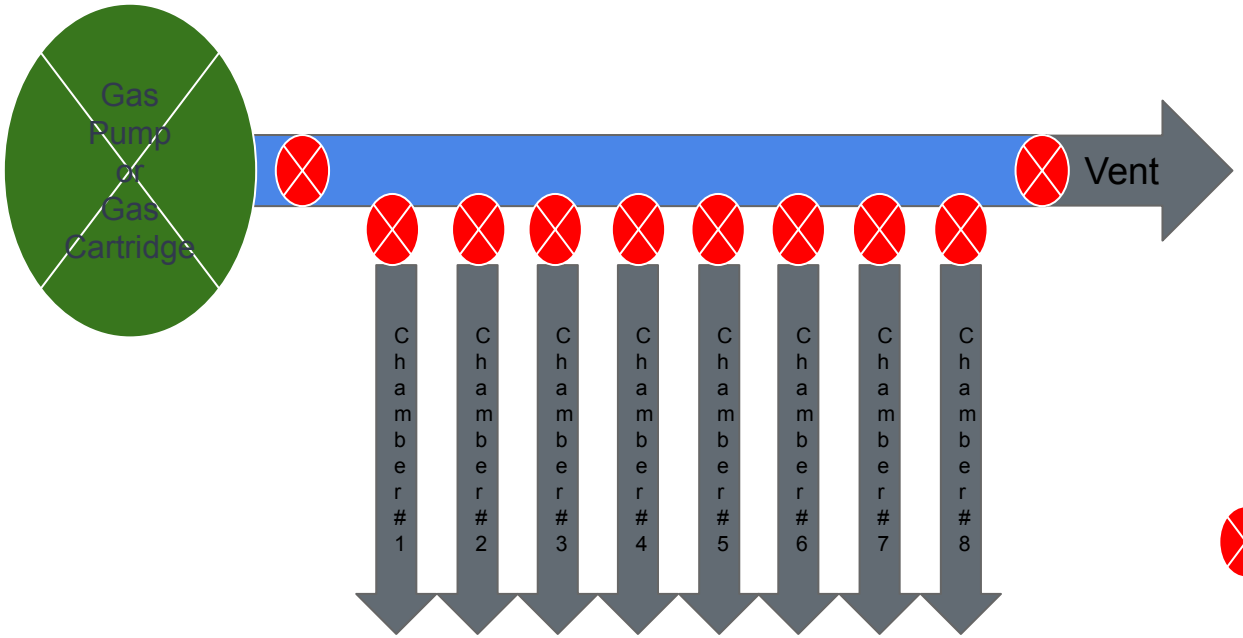
The Calder Lamination System - Man & Fab



Complex Sequential Fabrication

Caldera Lamination Controller System

- Open Valve 1 - Pressurize Chamber 1 to set pressure - Send Bonding Pulse to Chamber 1.
- Open Valve 2, vent Camber 1 to 2. Close 1, pressurize 2 - Send Bonding Pulse to Chamber 2.
- Repeat per N Chamber amounts.
- Venting sequences recycles pressure, saves pump energy.
- Uses each Chamber as pressure accumulator.



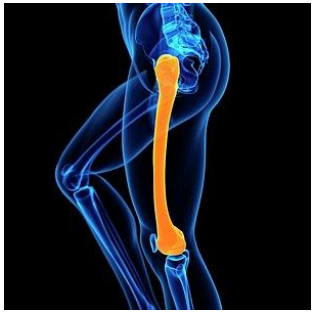
Applications of *the Caldera Lamination System*

Aerospace

Build extremely large structures in space, that can support an atmosphere. Create mechanical structures and expansions on-site.

Energy

Create stable piping systems at the same time of drilling, increasing safety.

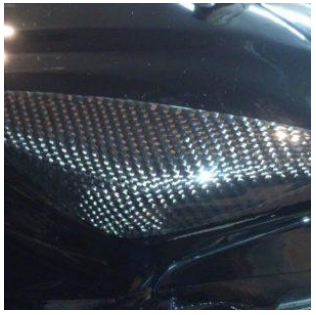


Medical

Build custom medical implants with less invasive surgeries, greater accuracy and faster healing time.

Construction

Fabricate structural building components on site. I-beams and A-frames in a box.



Automotive

Create automotive frames, within the cycle time of an assembly line.

Commercial

Create hardened emergency shelters with solar and communications panels.

Seed Round Investment Opportunity

Instaclave Technologies is seeking Seed funding for the following:

- **R&D -** Continue Research and Development efforts, partnering with UC Berkeley Material Science Labs.

- **Final Patents -** Convert a series of provisional process and technology patents into final patents.

- **Licensing -** Creation of an aggressive design and licensing program.

- **Strategic Development -**
  - Create prototypes, samples, demo's and guidelines to successfully apply the *Caldera Laminate Technology* out of an Instaclave Technologies R&D facility.
  - Partner with Strategic Investors to grant exclusive licensing rights to industry verticals.

Instaclave Technologies - Current Status

We have CRADA (see Glossary) contract with the Materials Science laboratory at the Lawrence Berkeley Labs (**LBL**) at the University of California in Berkeley CA, over seen by the Department of Energy. Instead or raising capital to build a world class lab, Calder decided to 'rent' **LBL.** They are assigned the task of resolving the binary epoxy variables equations. (see Glossary).

Extending the R&D effort to additional DOE lab, we are in negotiations with the Oak Ridge National Laboratories (**ORNL**) in Oak Ridge Tennessee. The Department of Energy's Manufacturing Demonstration Facility, established at **ORNL**, helps industry adopt new manufacturing technologies. We are negotiating the task of Carbon Fibre component fabrication and our 3D printing needs at their Additive Manufacturing Facility.

We are actively pursuing multiple Small Business Innovation Research Grants with National Aeronautics and Space Administration (**NASA**) , the Department of Energy (**DOE**) and the Department of Defense (**DOD**).

The ***IT*** team is actively raising traditional Venture Capital via their contacts over the last 40 years in Silicon Valley and San Hill Road. We expect no obstacle in reaching our funding goals.

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Instaclave Technologies – FAQ's

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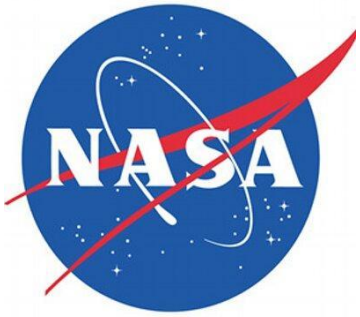
Instaclave Technologies Partners

Lawrence Berkeley Labs

Department of Energy

Oak Ridge National Laboratories

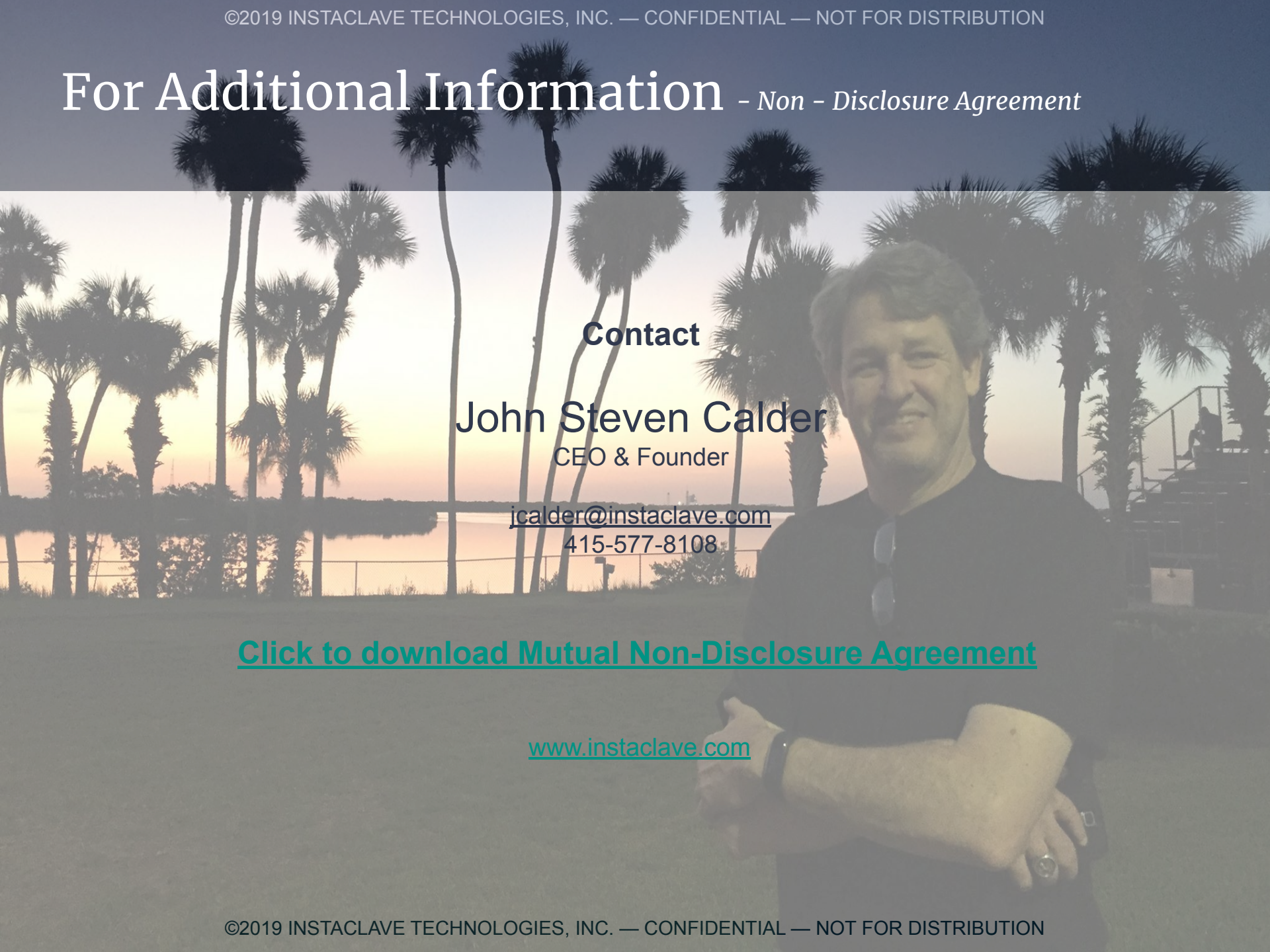
Small Business Administration



National Aeronautics and Space Administration

Department of Defense

For Additional Information *- Non - Disclosure Agreement*



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