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Climate Innovation Program

Additional submitted attachment is included below.

WAYNE BLIESNER

Chief Scientist, founder, ADI Lighting Corporation and Fundamental Lighting Solutions

BACKGROUND SUMMARY

Wayne Bliesner is the CEO and Founder of Fundamental Lighting Solutions, ADI Lighting Corporation, ADI Solar Corporation, and ADI Thermal Power Corporation. He holds a BSCE and MSCE in Aeronautical Engineering from the University of Washington and has been researching and developing alternative energy power generation technologies for over seventeen years. Mr. Bliesner is an expert scientist and physicist, with an advanced understanding of chemical reactions, metallurgy, and liquid chemistry. As a distinguished scientist and engineer at Boeing for over 20 years, he has a detailed understanding and experience in building large-scale applications of complex programs. Mr. Bliesner has been the Chief Scientist and Principle Investigator on multiple energy related projects.



Along with holding a BSCE and MSCE in Aeronautical Engineering from the University of Washington, Wayne was also a Professor there for 3 years.

Over the last 40 months Wayne has worked LED lighting improvements and holds a patent in the integration of a high efficiency Luminaire system that operates at 200 lumens per watt with a 20+ year life. Development during this time resulted in an understanding of LED systems, heat sinks, high efficiency power supplies, and low cost manufacturing technique for the LED market. A luminaire system now has U.L. certification with a factory planned for spring of 2018.

He was the Lead Engineer and Principal Investigator at Boeing for over 20 years, and liaison to NASA for 10 years, through which time he gained detailed understanding and experience in building large-scale applications of complex programs. Currently, Wayne is named in over 160 patents, including 7 patents he came up with for Boeing, to which end every Boeing aircraft in the sky today has at least 1 of his patents, and he is currently named 9 times in Wikipedia.org for his innovations in human-powered flight and human-powered aircraft designs.

He also holds 24 patents on his Calcium Hydride Reactor energy storage system (a better "solar" battery) and has 13 patents on his High-Efficiency Dual Shell Stirling Engine design, which he developed over the course of the last 16 years since leaving Boeing. He is also the system architect for those programs with his special expertise and background in complex system design and chemical reactions.

Wayne's skills as a multidisciplinary leader, along with his flexibility and creativity in problem solving, allow him to carry difficult tasks to completion. Wayne also has significant expertise in the following areas: viscous and inviscid 2D and 3D code work including K-E code work on confluent boundary layer effects, Aerodynamics Grid and Paneling System geometry procedures and programming, wind tunnel-to-flight issues and physics, slat/ Krueger/flap/ design and analysis of both 2D and 3D issues, configuration development, ground effect, low Reynolds number physics, 2D test technique, 3D test technique, flight test experience, multidisciplinary interactions, high-lift wind tunnel tool development, and a strong aptitude for both interactive and planned innovation.

A summary of Wayne's skills, include: Engineering Management, Systems Engineering, Aerodynamics, Chemical Engineering, Biofuels, Optics, Biotechnology, Aerospace coupled with Aeronautics, globally active as a Government Liaison, along with full understanding to implementation of 3D Visualization, System Energy Management, Renewable Energy and Renewable Resources on all form and scale.

His specialties include: Fluid flow properties, aerodynamics, multi-disciplinary optimization, solar optics, optical system design, high-temperature chemistry, metallurgy, corrosion chemistry, ceramics, system integration, technical collaboration and structural design optimization.

For ten years at Boeing Wayne was the team lead for high lift Aerodynamics research for the Boeing Commercial Airplane division. He was lead for a team of 15 engineers working advanced Aerodynamics and systems research to support ongoing commercial airplane programs. The research involved a coordinated effort with Boeing contracted teams in Japan with a multi-year development program involving state of the art wind tunnel test facilities in Farnborough England. As team lead he coordinated and managed all of the group activities including budgets and staffing. He worked directly with upper management providing year to year planning and coordination. During the ten year program Wayne was also given the responsibility to coordinate a 5 year NASA research and development program. This work involved the planning, testing, and coordination of a 100 million NASA research budget. The activity was so successful it expanded to include research in Aerodynamics, Structures, Noise, and multi-disciplinary system optimization.

Wayne Bliesner Scientist/ Multidisciplinary Engineering

Founder & Chief Scientist, ADI Solar Corp
Qualifications, Experiences, Capabilities (PQS)

KEY ACCOMPLISHMENTS

- 30 U.S. and International Patents on Energy Renewal Generation
 - Hyperbolic mirror design, to focus the off-axis light more accurately
 - International patent for “Leading Edge” assembly on all current Boeing airplanes
 - PIE Award for Multi-Disciplinary System Integration
 - Inventor of the CHBCS Solution
 - Head of the “High Lift” Research Group
 - World Leader in Human Powered Flight and Aerodynamics
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BACKGROUND & EDUCATION 72-80

BSCe and MSCE Aeronautical Engineering, University of Washington, 1978, 1980

2022 to 2023: Design and analysis focusing on chemically resistant coatings. Applications include operational coatings that are stable over 1100 C in a liquid calcium containment environment. Coating design involved increased heat of formation and cohesive bonding energy for both primary and secondary calcium alloys and contaminants. Additional coating designs included hard mirror coatings for desert operation, liquid aluminum, and titanium containment. Multi-layer coating development was used to handle various anticipated environments including air, hydrogen, and halogens. Silicon and metallic glass coatings studied for their ability to handle liquids and gasses at intermediate temperatures. HPIMS coating technology identified as demonstrated process for hermetic seals across multiple technology areas. Provisional patent in work for coating improvements.

2020 to 2023: Detail integration and design of solar power plants from 50 KW to 10 MW size range. Work finalized design for twin metal hydride system using calcium and magnesium as primary materials. Coating technology integrated into designs to facilitate 30 year system life. Manufacturing chemistry integrated to provide sustainable growth to terra-watt power system levels without creating waste streams for the environment using oxides as starting materials. Economics studied to create real world growth potential and economic competitive integration into the energy landscape. Detail work completed on solar optics and system design for range of power plants using down beam architecture. Provisional patent written to summarize complete system design and features.

2015 to 2022: LED lighting program evolved from white light design and UL certification to multi-color balanced green house lighting. Plant design studied with LED designed to provide light energy at a more optimum color for various stages of plant growth. Specific attention to the two chlorophyll production requirements. Broad spectrum plant catalyst requirements integrated to provide added plant growth efficiency. Sufficient higher frequencies integrated in the blue light range to eliminate mold and bacteria growth on the plants. Application of the design into a commercial LED light fixture resulted in UL certification for the greenhouse light. Testing and commercial application at a greenhouse facility in Eugene Oregon demonstrated in up to 50% increase in plant growth characteristics and yields. Provisional and full patent written to identify unique performance features and benefits.

Automated factory setup to provide manufacturing for the light fixtures and electronic power box assembly. Factory allowed processes which included starting from aluminum extrusions, LED chips, and raw circuit boards to a complete system. Multiple automated machines were purchased and installed in a 4000 sq ft facility in Monroe, WA. Machinery included multiple CNC mills, plastic injection machine, two LED chip placement machines, a circuit board chemical etching system, an automated wire crimping machine, and an automated oven with conveyor systems. An in plant compressor system was installed with air integrated in the facility. All 3-phase wiring and transformer setup was carried out with the team. Molds, tooling, and jiggging were fabricated in house. A process was setup to copper coat aluminum heat sinks after they were 3-D milled from extrusions. Factory production flow and handling were setup from raw materials to final delivered hardware. A team of up to 10 staff were managed for both the automated machinery and the final assembly work. An automated plant holding fixture was designed and prototyped including servo and gear motor movement to allow multi-level plant harvesting. Programming and fabrication experience was obtained for all the machines in a commercial industrial environment.

2000 to 2015: The Company, Alternative Designs, Inc. was incorporated in the fall of 1997. Full patents were submitted for the dual shell Stirling engine in 1996. In 1999, Mr. Bliesner formed ADI Thermal Power Corp. solely to advance the development and commercialization of an ultra-high efficiency Stirling engine for the Distributed Power Generation market. Mr. Bliesner formed ADI Solar in 2009 to develop stored solar energy technologies with the goal a creating a cost competitive continuous solar to electricity solution. He currently has energy patents in:

- Dual shell Stirling engine technology including gas backup improvements
- Calcium hydride solar thermal storage system
- Low Cost Helio-stat technology
- Process and system for solar energy, CO₂, and water to gasoline
- Stall and pitch up tailoring of leading edge slat systems
- Flap tailoring for performance optimization in a wake field
- Single pivot slat concept (currently in use on the 777)
- He also has several invention disclosures in various stages of evaluation

1980 to 2000: Wayne Bliesner has spent 20 years working in the research field at Boeing and currently has seven patents in the aerodynamics, systems, and structures technologies. Mr. Bliesner has shown significant skill as a multidisciplinary team leader and focused research leader. Mr. Bliesner has shown significant flexibility and creativity in problem solving and carrying difficult tasks to completion.

WORK EXPERIENCE

President, Alternative Designs, Inc.

1985 to Present

As founder and President, Mr. Bliesner set up the company in 1985 as a consulting firm for high performance composite design and manufacture. Consulting projects ranged from electric buses, sailboats, bicycles, and airplane design, including a one person electric airplane. Several techniques were developed for rapid prototyping composites

and mold construction. Some of this work resulted in composite manufacturing spin-off companies. The company completed 12 human powered aircraft over the 10 year period. These aircraft advanced to the point of world class status; the latest aircraft is currently a contender in a one hour marathon competition put on by the Royal Aeronautic Society. Several lectures in the U.S. and England have been given relative to these designs.

Mr. Bliesner left Boeing in June of 1995 to work at Alternative Designs full time on a 1 KWH/Kg Electro-Chemical-Thermal(ECT) battery system and improvements to Stirling engines. ADI was incorporated in September of 1997. Several Stirling engine improvements have been developed over the last three years which have resulted in four Stirling engine patents and one ECT battery patent. The Stirling engine patents are also being filed internationally. Mr. Bliesner rejoined Boeing after filing the Stirling engine and ECT cell patents in the fall of 1996.

The corporation moved from a 1200 sq ft private laboratory to a 3500 sq ft. commercial laboratory located in Woodinville, Washington. An SGI R-5000 work station is currently set up at the commercial laboratory and office. Boeing is loaning Alternative Designs Inc. the automated graphics program AGPS which provides a state of the art automated gridding, graphics, and design capability. The 3-D codes, DYNA and NIKE, are currently in use at the lab. A 4-axis Wells Index numerical control milling machine was installed in May of 1999. A 2-axis numerical control lathe was installed in October of 1999. A 25 KW induction brazing system was installed in December of 1999. The private laboratory currently holds a high temperature computer controlled oven with capabilities to 1200°C and all of the diffusion welding equipment. A second Haas CNC mill and lathe were added in 2008 to the rapid prototyping lab.

The Boeing Company 1997 to 1998

Work over the last year has focused on advanced programming activities in the Tools Methods and Technology AGPS group. The AGPS group is the Aero Grid and Paneling Software group which supplies automated geometry software to the various project groups within Boeing. Mr. Bliesner is project manager in support of the High Lift Paneling Procedures software package. He is also program manager in support of software contract work currently being developed through Dynacs engineering.

Since rejoining Boeing, two new patents in High Lift have been filed with Boeing as improvements to Mr. Bliesner's third patent on the single pivot slat concept. The single pivot slat patent was developed and installed on Boeing's latest aircraft, the 777.

Alternative Designs, Inc. mid 1995 to 1997

Took a year and a half Leave of Absence to complete patent work on the Stirling engine system, ECT battery and Diesel Emission Particle Oxidizer. See description above.

The Boeing Company 1979 to mid 1995

Mr. Bliesner has 15 years of experience working in high lift aerodynamics, the last 3 years as lead engineer in the Advanced Technology and Development High Lift Group and Principal Investigator for the NASA Subsonic Initiative High Lift Sub-element.

Mr. Bliesner started work at Boeing in the 757 High Lift group in 1979 working on ground-effect correlations, pre-flight issues and installed nacelle blowing effects. In 1980, he moved to the 7-7 group to work on configuration development issues. This work included detailed configuration trade studies and wind tunnel-to-flight predictions, including wind tunnel testing and database calibration on the 7-7 aircraft. He was also involved in high Reynolds number flap design that tested 2D designs at the Boeing Research Wind Tunnel and NASA-Langley Low Turbulence Pressure Tunnel. In 1984, he worked on the 767 wind tunnel to flight issues. He also worked at documenting various nacelle integration tests in high lift. In 1986, he moved to the 7J7 airplane program where he was involved in high lift theoretical design work in configuration development. In 1989, he moved to the Advanced Technology and Development High Lift group where he continued to work design issues.

Mr. Bliesner did a considerable amount of work in three-dimensional analysis and geometric programming that resulted in a significant improvement in three dimensional paneling techniques. He worked on leading and trailing edge High Lift flap design and high Reynolds number 3D testing. He evolved a new design package for flaps that allowed constrained 3D flap shapes to be generated while maintaining desired pressure distribution philosophy. He worked the 3D multidisciplinary issues for slat and flap systems that included heading a team to study leading edge simplification issues. He was continually involved in wind tunnel test techniques and improvements.

AREAS OF EXPERTISE

Engineering areas include viscous and inviscid 2D and 3D code work including K-E code work on confluent boundary layer effects, Aerodynamics Grid and Paneling System geometry procedures and programming, wind tunnel-to-flight issues and physics, slat/Krueger/flap/ design and analysis of both 2D and 3D issues, configuration development, ground effect, low Reynolds number physics, 2D test technique, 3D test technique, flight test experience, multidisciplinary interactions, high-lift wind tunnel tool development, and a strong aptitude for both interactive and planned innovation.

Engineering Experience:

- O Setup and operational experience with automated industrial equipment
- O Tig and gas welding with stainless and aluminum
- O Computer programming for both machine operation and aircraft design processes
- O R and D lab setup for engine development with multiple CNC lathes and mills
- O Design of electronic system and power supplies for both control and automation
- O UL and state certification processes
- O Induction brazing equipment and processes
- O Diffusion bonding of stainless hardware
- O High temperature chemistry and processes
- O Factory optimization
- O Detail metallurgy and component design
- O Corrosion elimination with specific coating applications

- O Battery charging and systems for fork lift operation
- O Detail plant and system airflow design and optimization including liquid cooling systems for tooling molds
- O Lighting design for increased efficiency and plant operation
- O Stirling engine design, optimization, and prototyping
- O Management, budgets and planning for business operation
- O Team optimization and management both small and large scale
- O Environmental planning with focus on creating sustainable manufacturing environment
- O International business processes and relationships including processes for shipping
- O Liquid pumps and flow design
- O Heat transfer and system design
- O Mold design and fabrication
- O Factory integration requirements for Cobot usage in production environment

