natural order

THOSE IN SEARCH OF INNOVATION NEED TO OPEN THEIR MINDS TO NEW METHODS OF TEAM BUILDING, PROCESS MANAGEMENT AND THE WONDERFUL EXAMPLES OF NATURE

Airline travel and innovation are topics that enjoy broad discourse and equally broad meanings. To dramatically improve the passenger’s experience during airline travel, we must move beyond the theatrical ambience of design, and transform it so that the passenger is drawn into a truly enjoyable experience. Consider the places we choose in life that transcend our daily existence, such as a spa, a restaurant or a resort. In this context, it becomes clear that breakthrough innovations could redefine the air travel experience. With this greater goal in mind, Aircraft Intelligence applies process, team-building and industrial research to rapidly deliver functional innovations.

Systemic optimization: Process and team building are key to rapid innovation. Too often the design process consists of interconnecting highly individual solutions and a secondary attempt to integrate the suboptimized parts. Systemic optimization considers overall issues and continually refines integrated solutions through an interactive process of examination. This in turn leads to simpler, more efficient and lighterweight designs. The challenge is how to deal with a broad scope of innovative design options: the number of combinations can be staggering. We encourage ideas from diverse sources, catalog them, allow associations to cluster,
and then orchestrate selective evolution. Unusual discoveries are documented for potential future solutions - all ideas are stored and cataloged. In documenting the classic process, we create a broader resource for future solutions.

In addition to evolution, we take inspiration from nature by studying plants and animals. We observe the subtle effects of nature, and through biomimicry, our best ideas form. We pick these fundamentals to study and evaluate shape, mechanical and structural. We explore each of these elements in sequence and list, mimicking natural selection processes. By applying genetic algorithms - achieving effective solutions to our functional goal. The result is a systemic optimization in a much shorter period of time than linear methods.

The interior of an aircraft, even if not structural, has to be perfectly integrated with the flying object, which has its own economic balance in terms of the use of resources and the sustainability of the solutions adopted. This is something of a challenge! Life is monetized in a hostile environment at -50°C with very low material atmospheric pressure. When we are in an aircraft, for anything between 10 to 100 hours, we are living in hostile conditions. It is like having a home in the desert or at the North Pole. Technology is used to ensure satisfactory conditions for life in a hostile environment (sustainable development). In order to be efficient and sustainable, the design process cannot be a process of linear redesign, merely the sum of a number of separate operations. One cannot separately resolve the areas of flight, ventilation, oxygen, and depressurization, safety systems. Each of these systems represents a single component of the more comprehensive aircraft system. Therefore, focusing attention on a single functional area could introduce solutions that are unacceptable for the entire system (increased weight or bulk). The evolutionary design process takes a spiral path, in which materials, forms and structure interact to evolve to a specific integrated solution under the driving force of a target function and the constraints of the specific scenario. The material is chosen (it could be one of the components of a composite structure) is part of the process (linked to one or more functions so that not just one solution, but rather a whole series of design ideas, are combined. In design, it is wrong to be obsessed with a single idea and develop it obstinately; it would be a linear process.

**Team building:** Innovation comes from the integration of people, process, and technology. As a company that relies on global cooperation, our team needs to be robust and dynamic to balance the benefits derived from cultural differences and diverse points of view. Also, cross-disciplinary team contributions bring unique educational and professional experiences to the development in the course of innovation.

**Breakthrough solutions:** In a recent project, our design team assembled an international team to dramatically improve the environmental quality, space allocation, and passenger comfort of 383 interiors, while at the same time advancing layout flexibility, reducing weight, and speeding installation. In a three-month timeframe, our small team achieved the following selected results:

**Noise Attenuation:** Two primary sources of aircraft noise are: environmental control systems (ECS) and boundary noise. After observing air movement over sand dunes and cloud formations, we applied systemic optimization to various duct forms, quickly arriving at a design for lower noise. By mimicking the forms found in nature within the ducts themselves, and then placing the air exits in low velocity sections - the goal was met. Further optimization resulted in five-meter duct sections with all the required functional characteristics.

In searching for lightweight structures to support ducts and panels, a boundary noise solution evolved. A space frame was transformed into a composite spring frame, passively reducing vibration transfer between fuselage and the interior. Introducing a ballast to the fuselage, an air cavity, we considered deploying aerocene in a micro level for precise control. Micro-echo mechanical devices and sensor wire could offer precision airflow management. With a temperature differential in each zone and properly controlled, an individual’s comfort could be greatly improved. These change materials provided another alternative. Silicon-based stone has historically been used by many cultures to balance temperature extremes. From this inspiration, we considered the effects of Nano Silicon, and studied the behavior of liquid and foam. Engineered
Transforming travel: In this example, technical expertise combined with a sound design process and the input of an international team created rapidly evolved integrated solutions for noise attenuation, microclimate, flexible systems and lighting. For the end user, these innovations improve passenger comfort, allow greater flexibility in design solutions, maximize interior space, and with weight reductions improve range. For the industry, passenger satisfaction is obviously beneficial. In addition, weight reduction and improved aircraft performance, reduced installation times, improved maintenance efficiency and simplified manufacturing are benefits of this approach.

The team building and design process described has been effectively applied to a survey of industrial design projects in transportation as well as other industries. They can even be applied to the design of services. The keys are to build a small cross-disciplinary team, to dress in additional talent as needed, to follow the systemic optimization process, and to have creative fun.

Bob Swain
LEAD DESIGNER, CEO
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What is your definition of perfect design?
Balance and beauty, where the whole experience with a design is one of joy.

Is the term ‘innovation’ overused?
Yes, but what is the right word to describe a very real need for the creative transformation of the customer experience in an industry that has spent much resources, energy, and valued time in developing the machine, but little developing the experience?

When did you last feel at one with nature?
Very recently, snow-shoeing with a friend in the Pacific Cascade wilderness, completely free of other people and the mechanism world.

Do the marvels of natural design hint at a higher intelligence?
Yes, such exquisite and evolved solutions so superbly integrated can be nothing else.

What do you do to put you in a more creative mood?
Solitude: “Only the person who is related can create, and to that mind ideas flow like lightning.” – Cicero

What is your favourite animal?
The eagle: fluid and gifted in its element (in the air) and clumsy when not (on the ground), most alive when fully in collision – a wonderful symbol of powerful natural movement and freedom.