Project Name: Nomadic Pneumatic  
Project Location: Honolulu, HI, USA

As both an exhibition/gathering space and an architectural exhibit, Nomadic-Pneumatic is an interactive and functional demonstration of design technology and the potentials of pneumatic structures. Behind its outward simplicity are layers of parametric design and engineering that become increasingly apparent as time is spent in and around it. Designed to inhabit a wide variety of indoor and outdoor spaces, its fluid materiality merges with its immediate physical surroundings, while simultaneously reflecting and revealing broader environmental conditions. Since its completion, Nomadic-Pneumatic has had thousands of visitors and has been exhibited in numerous public locations around Honolulu.

Its modified torus form features a large ring-shaped gallery space and an open-air central courtyard. The form quietly undulates as supporting air circulates inside and the tradewinds flow around it. Contrasting the opaque black fabric of the gallery are three metallic-silver, upward facing portals which open to the 600 sq ft courtyard, at once reflecting the surrounding environment and bringing light into the space. At night the opaque matte black base disappears while during the day the silver light wells reflect light and heat.

Portability and useability were two major design priorities as the space needed to be easily transportable between sites and erected with minimal effort. The entire structure is inflated in approximately 15 minutes and supported by a single off the shelf dryer fan. Once inflated the supply air is turned down and it maintains a firm, self-stabilized rigidity. After deflation, the 50’ diameter by 25’ tall structure can be folded and packed away as a 5’ x 3’ x 2’ bundle.

This project provided an opportunity to explore a unique design paradigm (high-volume, low-pressure pneumatic structures) as well as demonstrate the possibilities and limits of advanced design software and fabrication technology. It is constructed from 185 individual pieces made from 36 unique patterns, and has an inflated volume of 20,400cu ft defined by 6,060 sq ft of Denier Cordura fabric. The use of advanced CAD and parametric design software throughout the design process allowed repeated analysis and revision of highly complex formal iterations in both inflated and uninflated states prior to fabrication, which was critical to its success.

Challenging aspects of the project include the scale, complex geometry, and the precision required to fabricate and assemble the panels. While the project was approached as a design exercise in spatiality rather than form, it also necessitated working closely with the fabricator to design and choreograph the entire assembly process. Because the structure is volumetric and the fabrication tools and techniques used to construct it are usually used to build tensile (2D) elements, programming the entire construction process was critical to its success. The structure was divided into regions and subregions which were cut, labeled and welded before being carefully assembled into a progressively larger structure.
ASSEMBLY DIAGRAMS