Photo: Grant Brummett

Pneumatically Controlled Articulated Wings

Alexis Noriega with Chelsea Miller

A cosplayer and professional wing maker reports her experiments making pneumatically controlled wings.

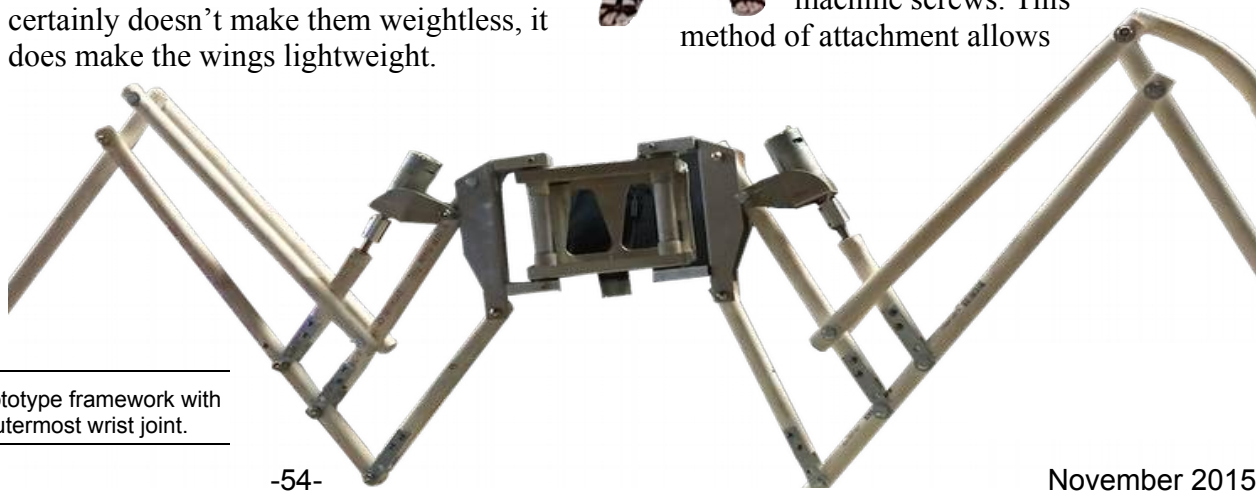
I made my first set of costume wings just because I wanted to. I love birds wings and feathers, and am an avid costumer and cosplayer. Without even having a specific cosplay in mind, I decided to try my hand at crafting wings to wear to a convention. I never expected the support or interest that followed, but a few commissions turned into The Crooked Feather shop on Etsy.

On October 27th, I posted a video demonstrating my recent experiment with pneumatically controlled articulating wings to The Crooked Feather's Facebook page, and within just a couple of days, it had reached viral status. It currently has over 20,000 shares on Facebook, saw several hours on the front page of Reddit, and the duplicate video I later posted to YouTube now has over one million views.

My desire for moving wings that looked realistic drove me through several iterations that were too heavy, too cumbersome, too unstable, or too easily broken, until I finally came up with the design for the pneumatic wings featured in my video. The frame for the wings is made from square aluminum tubing, which allows for precise and controlled movements. While this material certainly doesn't make them weightless, it does make the wings lightweight.

The frame has three different pivot points to create realistic, natural movement when the wings open and close: one at the base near the shoulder blades, one near the middle of the wing at the "elbow," and one at the wing equivalent of the wrist. (below)

The large pinion feathers at the bottom of the wings are each bolted to the frame separately with machine screws. This method of attachment allows



Top: Wings raised by adding compressed air to pistons. *Right*: Prototype framework with three pivot points. Pistons are attached to upper elbow joint and outermost wrist joint.

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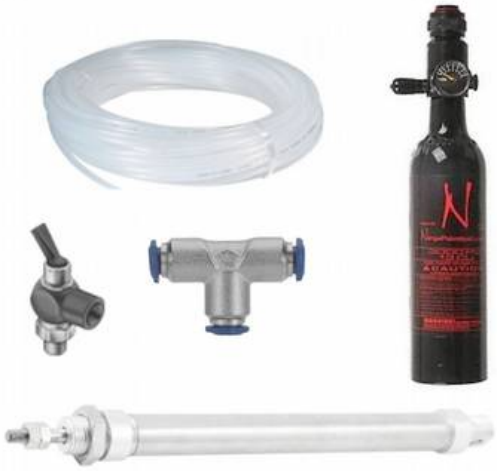
Prototype of wing to test out feather design.

each feather to move and pivot individually, just as real pinion feathers do on the wing of a bird. This also allows feathers to be swapped out for different colors or designs, so the same frame can be used for multiple wings. I hand painted the feathers for this particular set of wings according to the pattern requested.

The feathers at the top of the wings are real. They attach to sleeves made from a combination of stretch and regular, non-stretch fabrics that fit over the frame. This mix of materials are patterned and sewn very particularly so that certain parts of the sleeves can stretch and constrict as the wings open and close while still maintaining full coverage of the aluminum frames. The real feathers paired with the fake help the wings appear more realistic.

The wings are powered by a pressurized, refillable air tank attached to the base of the frame that sits against the wearer's back. They are controlled by a valve switch that when pressed releases the pressurized air from the tank through tubing and into two pistons, one on each wing, until the pistons fill and will no longer accept air. The direction of the air flow is controlled by the valve switch, so that the pistons either fill with or release air, which either lengthens or shortens the distance between two of the wings' pivot points. This causes the wings to open or close, as seen in the video.

Wings lowered by releasing air in pistons.



Pneumatic components: tubing, refillable air tank, valve switch, T-coupler, and piston.

The valve switch in this particular version is located at the hip, but can be repositioned anywhere by adjusting or changing the tubing. Connections in the air flow rig are "push-to-connect" fittings, making repairs and changes very simple.

When working with high-pressure air, safety is important. Good regulators to take the tank pressure from 3000 psi down to 100 psi to the piston are a must! Also be aware that you are wearing wings and that there is an risk of being blown over in strong winds

These wings are the result of much trial and error, and I am astounded, delighted, and humbled by the support with which they were received online. I am always happy to discuss my wings and their construction or to answer any questions. I also plan to produce an in-depth tutorial on these wings and working with pneumatics. Thanks, everyone, for your interest and support!

Alexis Noriega *has been crafting and building costume wings for the past three years. She is the owner and artist of "The Crooked Feather" on Etsy. She makes wings on commission only, and can make any wing design from static feathered wings to articulating and pneumatic wings to steampunk style wooden wings. See her Facebook page, and the video of the wings in this article on YouTube. Alexis lives in Phoenix, Arizona.*

Chelsea Miller *is a freelance writer, editor, and Japanese translator. See her portfolio and samples on her website.*