CBRNE Animal Model for Field Training

Jason Gitlin, Colin Graham, Brad Ruprecht, Charlie Steinert, Jeffery Warwick, Richard Moore
Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD

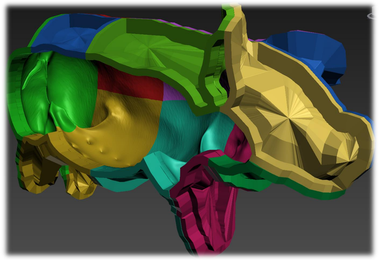
Overview

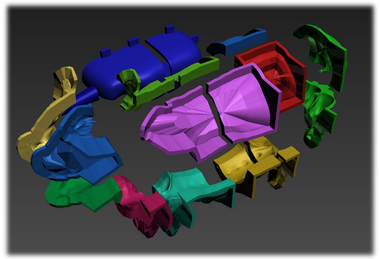
A team of Edgewood Chemical Biological Center (ECBC) artists, modelers, electrical and mechanical engineers, and logistics experts worked together to design, build, and deliver a training animal model that could enable more realistic training scenarios. The lifelike pig model was designed as a CBRNE training prop for the Field Assistant in Science and Technology (FAST) Center. This unique concept was to create a livestock prop that could be used during training exercises, and simulate reactions an animal might have if it came in contact with a chemical agent.

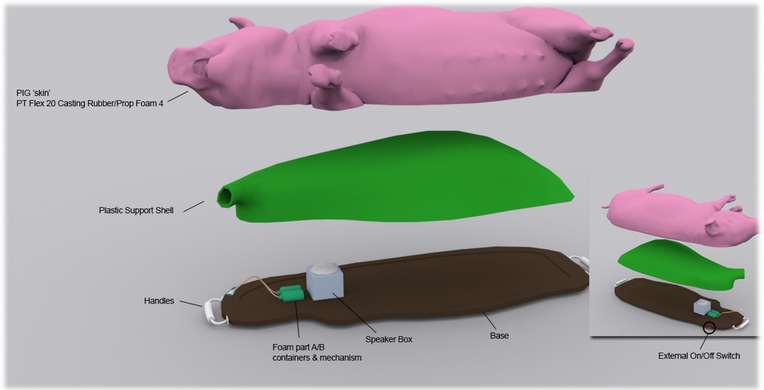
By integrating electronic functionality, this device can be used to provide a simulation of a dying pig which can more senses than just sight. The pig can make noises, smells, and foam at the mouth.

Design Approach

The cross-functional team used a technique called organic modeling, which is a fairly new capability within the Army. The development process started with designing a 3-D virtual model of a pig (above left). The process, materials and techniques were the same as would be used for a movie prop. Mold makers at the Smithsonian were consulted to ensure the right approach was being used. The ECBC team designed and built a small-scale mockup of the dying pig within 24 hours of the customer request to demonstrate and discuss the proof-of-concept (above right).

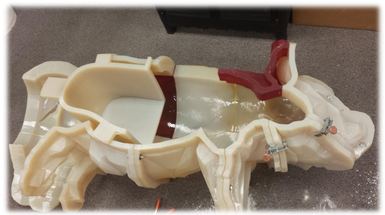






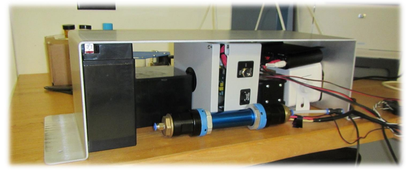
Rapid Fabrication

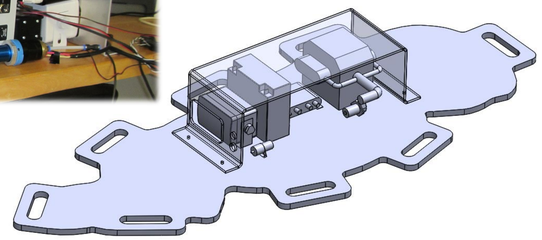
After the design was completed, ECBC used their additive manufacturing (also known as 3-D printing) capability to create the mold. The mold needed to be printed in 15 sections to create the full-size model (depicted above). Stereolithography (SLA), a process that uses ultraviolet (UV) curing resin, was used to produce the sections of the mold for assembly. Each section was bolted together to create the full mold (below left). The mold was brushed and filled with a layer of silicone to capture the detail of skin, giving it a realistic look and feel. The mold was then filled with expanding foam to finalize the outside shape and appearance of the pig, while also reducing the final model weight for transportability to field training exercises. A contoured insert was used to displace the foam for integration of the electronic and mechanical components.



Electrical & Mechanical Integration

Mechanical and electrical developed the electronic portion of the animal to achieve the sensory special effects - these included implementing a device to generate sound, pumps for the foaming mouth, and tubes to emit an odor. A Commercial Off the Shelf (COTS) device, the SensoryCo SmX MINI, was selected to distribute simulated aromas in an environment using a forced air method of dispersion. The components were integrated into a mechanical platform for use and maintenance. A rechargeable battery was installed in the system which would provide approximately 6hrs of run time. Scented crystals in the system can be removed and replaced as needed.





Final Deliverable

The final life size prototype was completed and delivered for field tests which are being conducted in Germany. Instructions for use and maintenance were provided with the deliverable.

Approved for Public Release

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