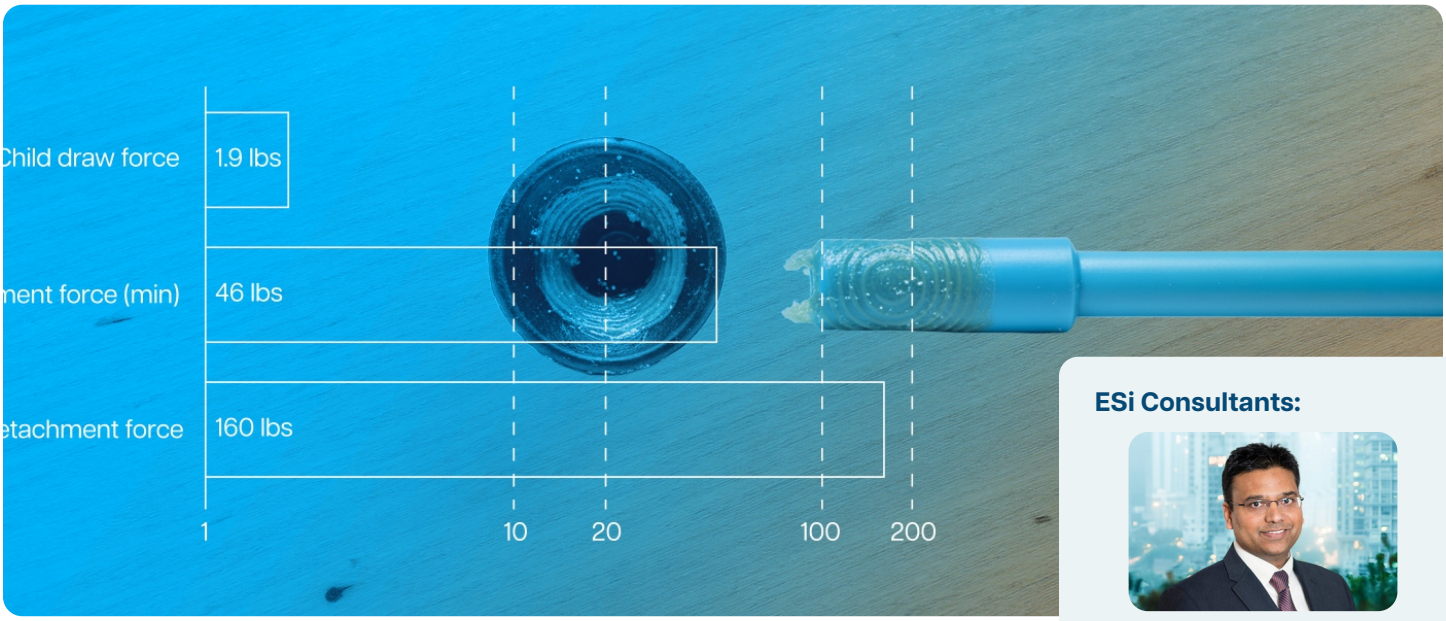
Case Study

Materials Science
Polymer Science
Biomechanical Engineering
Mechanical Engineering



Uncovering the Truth Behind a Toy Archery Injury

Engineering investigation proved toy archery set had no defects; suction cup separation resulted from prior use and not from a manufacturing flaw.

The Situation

A product liability lawsuit was filed against a toy manufacturer after a five-year-old child sustained an eye injury while playing with a children's plastic archery set comprising a plastic bow and plastic arrows with rubber suction cups. The incident allegedly occurred when the suction cup component separated from an arrow shaft. Surprised, the child rotated the bow toward his face and an accidental release of the arrow resulted in an eye injury.

Opposing experts claimed the suction cup failed due to inadequate adhesive bonding between the arrow shaft and the inside cavity of the suction cup and alleged that this represented a manufacturing defect, making the toy unsafe for children. ESi was retained to conduct an independent investigation and provide expert testimony.

Our Approach

ESi conducted a comprehensive multi-phase investigation involving materials analysis, ASTM F963 toy safety standards compliance, and biomechanical factors testing related to children's strength. The team performed detailed

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Services Utilized:

- Failure Analysis
- Lab & Inspection Services
- Product Design & Analysis

Our Approach *cont.*

visual and microscopic examination of the subject artifacts using both optical and scanning electron microscopy (SEM) with energy dispersive spectroscopy (EDS) to identify material composition.

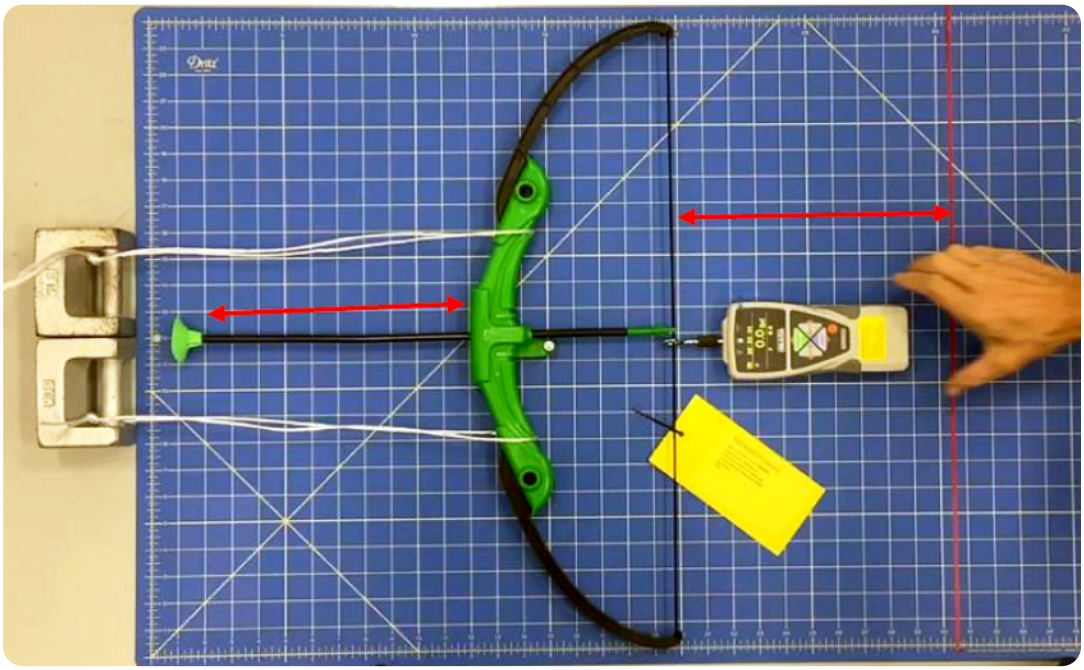
Critical testing included measuring the actual force required to draw the bow (1.9 pounds average) and comparing this to the adhesive strength of the suction cup to the arrow shaft. ESi analyzed extensive photographic evidence taken immediately post-incident, revealing crucial details that opposing experts had overlooked or misrepresented in their analysis. ESi's investigation exposed fundamental flaws in the opposing expert's testing methodology.

Our analysis definitively established that the toy had no manufacturing defects and met all applicable safety standards. The investigation revealed extensive adhesive coverage on both the subject suction cup and arrow shaft, contradicting the opposing expert's claims of inadequate bonding.

Most critically, ESi discovered silicon-based foreign debris inside the suction cup that was visible in photographs taken immediately after the incident. ESi's microscopic analysis revealed that the suction cup contained ground contamination (silicon-based particles) that could only have been introduced after previous separation and reassembly. This physical evidence, combined with the fact that a five-year-old child lacks sufficient strength to separate a properly bonded suction cup (which requires 46-160+ pounds of force), proved the component had previously failed and been reattached before the incident.

The Outcome

ESi's technical findings demonstrated that the manufacturer's product design of the archery set and quality control processes were sound, eliminating opposing counsel's manufacturing defect theory. ESi's expert testimony provided compelling evidence that the child was playing with a broken toy and not a toy with a product defect.



Overview of setup of pull test conducted for measuring force required to pull draw string of the subject bow to 10.5 inches

ESi

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