



Foam Dart Toy Gun Safety Recommendation Report

Author: John Doe, Product Manager

Recipient: E&E Toys

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Executive Summary

This report details the Foam Dart Toy Gun produced by E&E Toys and provides an analysis of the recommendations and budget justifications that would prepare the toy gun for consumer production. The product consists of four major components that meet the Standard Consumer Safety Specification for Toy Safety, ASTM-F963-17.

The required ASTM tests have a budget of \$140.00 though less extensive, these tests minimize an unforeseen hazard or legal issue with the toy. Additional recommended tests offer a comprehensive assessment of the toy with tests ranging from \$10.00 to \$85.00.

Completion of the required tests will bring the Foam Dart Toy Gun to comply with all ASTM standards, and verify its general safety for use by small children.

- Projectile Toy Test (ASTM 4.21) (\$95)
- Toy Gun Marking Test (ASTM 4.30) (\$45)

Completion of the recommended tests will ensure a full analysis of the Foam Dart Toy Gun's legal issues and verify its complete safety for use by small children.

- Folding Mechanisms Test (ASTM 4.13) (\$36)
- Labeling: Age Grading / Safety Labeling (ASTM 5.5.1 / 5.5.2) (\$85)
- Definition & Description: Instructional Literature (ASTM 6.1) (\$10)

Introduction

E&E Toys has asked ProAssess Testing Laboratory (“ProAssess”) to assess its new Foam Dart Toy Gun (“the Toy”) to determine applicable testing standards and safety requirements prior to production.

The toy produced by E&E Toys consists of four major components; firing mechanism, eyesight, foam dart, and barrel. The following report will lay out recommendations and justifications based on specific sections of the ASTM-F963-17 “Standard Consumer Safety Specification for Toy Safety” (“the standard”).

The resulting high-end and low-end recommendations and budgets will be presented. This report seeks to help E&E Toys balance consumer safety with budgetary constraints through ASTM standard requirements.

Discussion

Technical Description

The toy is an imitation firearm that resembles a handgun and launches a single foam dart with every pull of the trigger, Figure 1. The toy is lightweight weighing only 1.1 pounds and measures 10" x 2.5" x 7". It can be held, aimed, and fired easily with a single hand. There is an eyesight that can provide fair accuracy, as well as a barrel that houses the dart and the spring launching mechanism as it fires the foam darts. The toy will be made of a biodegradable resin from a reputable source with 3rd-party testing completed by the plastics manufacturer.



Figure 1: Foam Dart Toy Gun

Firing Mechanism

The firing mechanism consists of a trigger that when pulled releases a metal compression spring to launch the dart. The spring is housed inside the plastic barrel of the toy, along with the loaded dart. Under optimal conditions, the dart can launch up to a maximum of thirty feet.

Eyesight

The eyesight equipped by the Toy provides a method of aiming the dart, shown in Figure 2. The eyesight differentiates the gun from most others of its kind and is a key feature of the product. The sight consists of two clear, non-magnifying lenses at either end of a six-inch tube, mounted by molded plastic atop the barrel of the gun, as pictured in Figure 1.

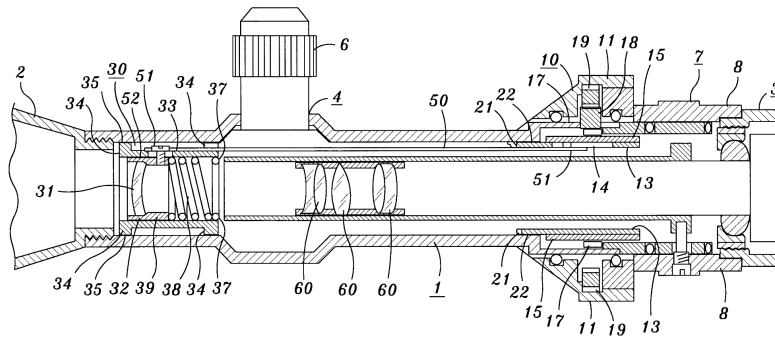


Figure 2: Eyesight Detail Drawing

Foam Dart

The foam dart consists of two minor parts: a soft foam shaft and an attached soft tip. The darts are designed for safety, using only lightweight, soft materials that will not cause harm. The shaft shall be made of lightweight foam and measures 7.2 cm x 1.3 cm. The tip will, as pictured, be made either of a lightweight rubber or foam material.

NOTE: Figure 3 is not affiliated with E&E Toys, but gives an accurate approximation of the potential dart.

<i>Foam Dart Technical Specifications</i>	
<i>Weight</i>	<i>0.97 grams</i>
<i>Length</i>	<i>2.83 inches</i>
<i>Diameter</i>	<i>0.511 inches</i>
<i>Range</i>	<i>30 feet</i>



Figure 3: Foam Dart

Barrel

The barrel is made up of molded plastic upon the frame of the Toy with a dart-holder and plastic connections. The foam darts are loaded into the barrel prior to firing. The barrel is a plastic cylinder, which is eight inches long with a radius of a half-inch. The foam dart is loaded into the barrel by hand, one dart firing at time, where it sits upon the firing mechanism components. The eyesight is mounted onto the barrel by plastic connections for aiming. There is a dart-holder mounted below the barrel, where one can store up to two additional darts.

Justification of Recommendations:

The ASTM-F963-17 Standard Consumer Safety Specification for Toy Safety contains the applicable specifications for the Toy, and lays out the specific tests and requirements for the development of the toy.

I. Safety Requirements:

The potential safety hazards posed by the toy gun are addressed in Section 4 of ASTM-F93-17. Since this toy will be made from plastic or biodegradable resin, this will be considered in the development process to have high material quality (Section 4.1). Furthermore, the content of the neon paint to be used is free of lead or other toxic materials (Section 4.3.5.1).

As the toy utilizes a finger-pulled trigger, the hazards of a folding mechanism should be considered (Section 4.13). Possible pinching or laceration might result if the toy is designed improperly. The trigger slides back linearly as it is squeezed and there are no pinch points with the proposed design.

Since the main function of the toy is to fire projectiles, all testing pertaining to projectile toys would be performed, and the standards for projectile toys should be considered (section 4.21). Furthermore, to differentiate the Toy from real guns, regulations regarding the markings will be followed (section 4.30).

II. Labeling Requirements:

Section 5 of the standard specifies labeling requirements. A specific label must be added to the packaging regarding the age guidelines for the toy. In order to maintain safe use, the toy should only be used by those of an appropriate age. This will account for the ability to use the gun, as well as potential hazards posed by the toy such as choking hazards. This projectile toy is therefore not suitable for small children (Annex A1).

III. Instructional Literature:

Section 6 of the standard specified instructional literature indicates that instructions are to be included with the Foam Dart Toy Gun. The instructions should be easy to read, specific, and in compliance with section 6.

IV. Potential Improvements

ProAssess has experience deploying similar products, and often during the analyses of new products, there is room for improvement. There are two such areas on this product we were able to improve. Improvement in these areas will prevent injury to the user as well as improve the overall quality of the Foam Dart Toy Gun.

- *Mechanical Trigger Lock – “Safety”*

The first major improvement which enhances the safety of the user is the addition of a mechanical trigger lock or “safety”. The trigger lock would prevent the user from accidentally shooting the gun. A misfire in close range could be dangerous to the eyes or face. It will also prevent the user from squeezing the trigger when in the “on” position. The added bar will prevent the trigger from acting as a lever and prevent it from engaging the firing mechanism.

- *Dart Holder – Geometry Modification*

One preexisting component that could use some improvement is the dart holder. The dart holder is located near the barrel of the gun and holds the darts in the same orientation as they are loaded into the gun to be fired. Both of these qualities allow for quick and easy reloading. The Foam Dart Toy gun could be used in relatively “harsh and abusive” environments where children are running around, dropping the product on the floor, kicking it, etc. The geometry of the base of the Foam Dart Toy Gun to encapsulate the dart holder portion of the gun was modified, making it more robust and less prone to failure.

Budget Recommendations:

Required Tests

Test Method:	ASTM Sec.	Cost:
Projectile Toys	4.21	\$95
Toy Gun Markings	4.3	\$45
Total Cost:		\$140.00

At a total cost of \$140.00, the above tests ensure that E&E Toys has met all requirements per ASTM-F963-17 for testing of this product. Each test will take approximately one business day to complete, with an additional day added for the compilation of a testing report.

Recommended Tests

Test Method:	ASTM Sec.	Cost:
Folding Mechanisms	4.13	\$36
Labeling: Age Grading / Safety Labeling	5.5.1 / 5.5.2	\$85
Definition & Description: Instructional Literature	6.1	\$10
Total Cost:		\$131.00

At an additional cost of \$131.00, the above tests will provide E&E Toys with the highest level of certainty that this product will be safe for all intended users. These tests are not required per ASTM-F963-17 but are highly recommended by ProAssess. Should these tests be pursued, an additional day will be required for each test. These tests can also be selected individually for the fee listed above.

Conclusion:

The Foam Dart Toy Gun will be ready to proceed into the next stages of production upon completion of the various tests discussed in this report. Two tests are required to be done on this product by ASTM-F963-17. These can be completed, and a report delivered within four days of the receipt of a purchase order for a fee of \$140.00. Additional, non-mandatory testing of the Toy is recommended by ProAssess to ensure the highest attainable level of consumer safety. These optional tests will cost an additional \$131.00 and will add three days to the report delivery timeline. It is also possible to only pursue specific recommended tests, these can be completed for the fee stated in the “Budget Recommendations” section.

A preliminary draft of this report was developed by Jamie Klien prior to his departure from ProAssess on November 30, 2021. Many sections have since been modified to better reflect the opinions and recommendations of ProAssess.

Appendix A: Sources

1. Foam Dart Image: Nerf Fandom, Dart. (10/7/19). Retrieved from <https://nerf.fandom.com/wiki/Dart>
2. Foam Dart Toy Gun Specifications. E&E Toys. 4/21.
3. ASTM International. F963-17 Standard Consumer Safety Specification for Toy Safety. West Conshohocken, PA; ASTM International, 2017.
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4. Figure 3:
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