



Contract No. 0JP-86-C-002

Abt Associates Inc. 55 Wheeler Street • Cambridge • Massachusetts 02138-1168 Telephone: (617) 492-7100 Fax: (617) 492-5219

Test of the Visibility of Toy and Replica Handgun Markings

August 1989

Contract No. OJP-86-002 National Institute of Justice

Kenneth Carlson and Peter Finn

146870

U.S. Department of Justice National Institute of Justice

This document has been reproduced exactly as received from the person or organization originating it. Points of view or opinions stated in this document are those of the authors and do not necessarily represent the official position or policies of the National Institute of Justice.

Permission to reproduce this **constant** material has been granted by Dic Domain/NIJ

U.S. Department of Justice

to the National Criminal Justice Reference Service (NCJRS).

Further reproduction outside of the NCJRS system requires permission of the conception of the concepti

TABLE OF CONTENTS

			Page
Prefa	ace and A	Acknowledgements	vii
Exec	utive Su	mmary	ix
1	Introduc	ction	. 1
2	Experin	nental Design	. 3
-	Test Ad	Iministration	7
			· ·
	3.1 Pr	cocedures	
	3.2 Bi		. 10
	3.3 16	est Realism	10
	3.4 16	est Subjects	13
4	Test Re	sults	15
	4.1 Ar	nalytic Approach	15
	4.2 Fi	ndings	20
	4.	2.1 Imitation (Replica) Handguns	20
	4.	2.2 Toy Handguns	21
	4.3 Co	omments	22
5	Conclus	ions	27
Apper	ndix A	Public Law 100-615: The Federal Energy Management Improvement Act of 1988, Section 4	31
Аррен	ndix B	U.S. Department of Commerce Final Rule on Toy Firearm Markings	33
Apper	ndix C	Situational Characteristics of Incidents Involving Toy Guns	35
Apper	ndix D	Written Test Instructions Given to Test Subjects	38
Apper	ndix E	Test Evaluation Form	39
Apper	ndix F	Confidentiality Request Handed to Test Subjects	41
Apper	ndix G	Handout Given to FBI National Academy Students	42

Appendix H	Detailed Responses by Weapon Marking, Illumination, and Distance	43
Appendix I	Univariate Analysis of Variance (ANOVA) Firing Rates by Type of Marking, Distance, and Lighting	49
Appendix J	Individual Data Collected from Each Test Subject June 6, 1989	50

TABLE OF CONTENTS

(continued)

L	ist	of	Tables	

Page

Table 1	Number and Percentage of Test Subjects by Rank	13
Table 2	Number and Percentge of Test Subjects by Years as Sworn Officer	14
Table 3	Percent of Trials in Which Test Subjects Fired, by Type of Weapon Marking and Distance from Role Player	16
Table 4	Standard Errors of Percentages Reported in Table 3	16
Table 5	Number of Trials	16

List of Figures

Figure 1	Diagram of Test Procedures in Sequence	8
Figure 2	Incident Light by Location, Date, and Time of Text	12
Figure 3	Percentage of Trials in Which Test Subjects Fired, by Type of Handgun and Distance from Role Player (n=86)	17
Figure 4	Percentage of Test Subjects Who Fired by Sequence of Trials and Distance from Role Player	18
Figure 5	Percentage of Test Subjects Who Fired When the Transparent Green Squirt Gun Was Used	23

Preface and Acknowledgements

A number of incidents have been reported in which law enforcement officers (and civilians) have fired at individuals handling toy guns in the mistaken belief that these persons were armed with a real weapon and creating a life-threatening situation. The frequency of these incidents appears to have been increasing as more realistic toy guns have come on the market. In response to these tragedies, several states have required that toy or imitation firearms be conspicuously marked. Other jurisdictions have considered the prohibition of all toy guns. In an effort to introduce uniform national standards, Congress amended Public Law 100-615 to require that all toy guns manufactured or sold after May 5, 1989, be marked to distinguish them from real weapons in the hope that law enforcement officers would withhold their fire when The Secretary of Commerce published regulations specifying five appropriate. distinctive coloring methods to be used as marking systems. A study was conducted by Abt Associates Inc. to test the visibility of the five marking systems under simulated police combat conditions in order to assist the Secretary in deciding whether and how to revise the current standard. This report presents the results of that study.

The study was designed and conducted by Abt Associates Inc. The Practical Applications Unit of the FBI Academy in Quantico, Virginia, was an indispensable partner in the effort. James Pledger, unit chief, gave permission to conduct the test at Hogan's Alley, the unit's simulated town center. He also authorized the recruitment of volunteer test subjects from among the FBI National Academy student body. Donald J. Gray, Supervisory Special Agent with the Practical Applications Unit, played a major role in refining the test procedures and materials, mapping out a test course at Hogan's Alley, telephoning local law enforcement agencies to solicit volunteer test subjects, and assisting in a variety of critical ways during the administration of the pre-test and test. Mr. Gray's years of experience designing and administering realistic training scenarios enabled the study to succeed.

Lester Shubin at the National Institute of Justice played a key role in locating test subjects for the pre-test and test, and in facilitating the use of Hogan's Alley as the test site. John Whidden, Paul Estaver, and Frank Vacarella of the National Institute of Justice also provided assistance.

Administrators in several law enforcement agencies in northern Virginia generously provided officers from their departments to act as pre-test and test subjects. Many of the officers and all of the FBI National Academy students participated on their own time. Diana Wahlquist of Day By Day Associates, Inc., in Dumfries, Virginia, provided the role players, each of whom acted his part well and recorded the data accurately.

William Rhodes, Ph.D., Abt Associates Inc.'s technical reviewer, suggested valuable improvements in the study design and final report.

Executive Summary

On November 5, 1988, Congress passed and the president signed the Federal Energy Management Improvement Act of 1988 (Public Law 100-615) which requires that all toy guns manufactured or sold after May 5, 1989 be marked to distinguish them from real weapons. (See appendix A.) The regulations, published in the <u>Federal Register</u> (see appendix B) by the Secretary of Commerce, require one of the following markings: a blaze orange plug inside the muzzle; an orange band covering the outside end of the muzzle; construction of transparent or translucent materials; coloration of the entire surface with bright colors; or predominantly white coloration in combination with bright colors. The Act also required that the National Institute of Justice "conduct a technical evaluation of the marking systems . . . to determine their effectiveness in police combat situations."

To accomplish that objective, the National Institute of Justice (NIJ) devised an experiment in which police officers simulated confrontations with "assailants" armed with accurate unmarked replica pistols ("real" pistols) and with toy guns marked in accordance with the Federal Regulation. These experiments, conducted at the Federal Bureau of Investigation Academy Hogan's Alley facility in Quantico, Virginia, involved 89 police officers drawn from a cross section of the nation's State and local police. The confrontations occurred at distances of 15 and 30 feet during daytime and nighttime illumination levels and various weather conditions.

The subject police officers were not permitted to exercise normal precautions when confronted by the assailant, such as taking cover; rather, they were required to respond to the threat by "firing" their own (deactivated) weapons if the assailant's handgun was perceived to be a real weapon. Specifically, the assailant, with the marked test weapon at his side, walked into view of the test subject and quickly turned to face the officer, simultaneously raising the weapon to aim and fire. The entire action was completed in about two seconds.

Under these simulated, restricted confrontation conditions, the officers were not able to recognize the presence of the blaze orange plug, prompting them to "fire" in nearly all confrontations at both 30 and 15 foot distances. The rate was indistinguishable from confrontations involving "real" pistols. The other markings were sometimes recognized. In descending order of recognition they were 1) clear green, 2) orange and purple, 3) white, and 4) orange band.

iх

It is clear from this study that the orange plug marking system does not help police officers to distinguish between toy guns and real guns. Use of an orange band improves discrimination, but it, too, is frequently misidentified. Marking systems which cover all or most of the toy in bright, non-metallic colors are more effective than either the orange plug or the orange band.

Introduction

The Federal Energy Management Improvement Act of 1988 (Public Law 100-615) requires the marking of toy guns in order to distinguish them from real weapons. The legislation also calls for a technical evaluation to determine the effectiveness of the marking systems in police combat situations. The legislation reflects Congress' recognition of the need for a uniform national marking system to ameliorate two kinds of problems. In a number of instances, children and others playing with or carrying a toy gun have been shot in the mistaken belief that they were posing a danger to the officers. In addition there has been an apparent increase in the use of realistic toy guns in criminal acts, some of which have also resulted in shootings.

National data systems do not provide comprehensive data on either kind of incident involving toy guns. Therefore, Abt Associates Inc. analyzed newspaper accounts of 41 reported incidents (resulting in 20 deaths) to identify typical patterns of toy gun-related shootings. This analysis contributed to the choice of conditions for the simulation. (A summary of the incidents is provided in appendix C.)

Both the Department of Commerce (DOC) and the National Institute of Justice (NIJ) recognized the potential impact on the nation's police of mandatory national requirements for the marking of toy guns. It was considered essential to have the direct involvement of police early in the evaluation process to obtain their opinions of the effectiveness of the proposed marking systems in their operating environments.

To achieve this, a focus group composed of Federal, State, and local law enforcement officials, representatives of the toy gun manufacturers, and staff members from DOC and NIJ met to discuss the legislation and DOC's proposed regulations. The meeting resulted in considerable speculation on the effectiveness of individual markings. There was total agreement that no reliable data existed to ascertain the extent to which any of the markings would positively identify a gun as a toy. Members of the focus group supported NIJ's efforts to undertake a test of the markings pursuant to the requirements of the Act.

After considering all recommendations, NIJ contracted with Abt Associates Inc. to design an experiment to evaluate the various toy gun marking systems using active police officers in simulated confrontations with armed assailants. The Federal Bureau of Investigation agreed to make its Hogan's Alley facility available for the conduct of the test, to refine the test procedures and materials, to map out a test

course at the facility, to assist in the administration of the experiment, and to obtain volunteer officers from academy classes to participate in the program. In addition, volunteer test subjects were recruited from local police departments in the metropolitan Washington, DC area, including Montgomery County, Maryland, Fairfax County, Virginia, and Prince William County, Virginia. A total of 89 police officers participated in the experiment.

The sections of the report that follow describe the manner in which the experiment was designed and conducted, and discuss the results and data analysis.

Experimental Design

Pursuant to the legislation, the objective of this study was to evaluate the extent to which each of the toy gun marking systems permitted by the DOC regulation enable trained law enforcement officers under stress to identify correctly a weapon as a toy gun. The experiment was conducted under various weather and light conditions, and at two distances of encounter.

Representatives of Abt Associates Inc. visited the FBI training facility, Hogan's Alley, prior to designing the experiment. Hogan's Alley consists of a simulated village center, complete with dwellings and a motel, movie theater, functioning deli, bank, drugstore, post office, and other retail establishments. Two locations were selected for the experiment, one at the front (street side) of an alley and the second at the rear of the alley. The first location provided street light illumination at night, while nighttime illumination at the second location was provided by three small exterior lights attached to the motel facade.

Abt Associates then developed specific encounter scenarios for each location, data sheets to record the results of each encounter, instructional material for the test subjects, and training materials for those playing the role of armed assailants.

The final test plan called for each test subject to experience a total of eight confrontations: three at location 1 and five at location 2. At location 1, the test subject stood on the sidewalk 15 feet from an alleyway directly ahead. The armed assailant walked from the alleyway to confront the officer. At location 2, the test subject was positioned 30 feet from the alleyway from which the armed assailant walked to confront the officer.

In each confrontation, the assailant walked into view on the sidewalk at a normal pace. Upon reaching the designated test point, the assailant turned toward the subject, raised the weapon to the aim point, and pulled the trigger. The entire action (appear, turn, aim, and fire) was accomplished in a fixed interval of approximately 2 seconds.

A total of nine test weapons were used:

• three unmarked accurate replica 45 caliber pistols

• two accurate replica 45 caliber pistols with a blaze orange plug in the muzzle

- one toy water gun (45 caliber pistol type) with an orange band around the barrel
- one toy water gun (Beretta model 92F) colored predominantly in orange with additional parts colored purple
- one toy water gun (Beretta model 92F) painted mostly in white
- one transparent green water pistol (Ingram MAC 11).

The unmarked accurate replicas were included in the test to force the officers to make a non-trivial distinction on each trial. Officers were not informed, and had no way of guessing, what fraction of the weapons they saw were "real." Thus they were forced to react to each confrontation on the basis of what they saw at the time. The unmarked replicas were extremely accurate in appearance, sound, and feel. Since experienced firearms instructors at the FBI academy were unable to distinguish them from real weapons except by close inspection, it is safe to assume that the test officers uniformly regarded them as real weapons during the experiment.

The two accurate replica 45 caliber pistols marked with the blaze orange plug in the muzzle were made by the same manufacturer who made the "real" unmarked replicas, and were identical to them except for the orange marking. The pretest had indicated that this marking would be much harder to identify than any of the others, and therefore more precise measurement would be required. To increase the statistical reliability of estimates for this marking, the simulation was constructed so that more trials were conducted using the orange plug than with any of the other markings.

Except for the transparent green water pistol, all the test weapons were of very similar size and shape.

After each confrontation, the role player, who acted the part of the assailant, recorded whether (and when) the officer "fired" his or her weapon during the confrontation. At the completion of the series of eight confrontations, each test subject was asked to sign a confidentiality statement promising not to discuss the test with other officers. Abt Associates Inc. staff then conducted a verbal debriefing with selected test subjects.

The local organization that the FBI Training Academy uses to provide role players for its training programs was contracted to provide role players for the toy gun marking tests. To maintain consistent test conditions, six males, aged 25-35, were

trained to play the role of the armed assailant. The training involved on-site simulations of actual test conditions.

It should be noted that employing children or juveniles as role players would have raised statistical problems. Even with much more training, it is doubtful that standardization could have been guaranteed among trials. Since the purpose of the test was to measure relative--rather than absolute--visibility of the markings, the test was designed to avoid as many sources of uncontrolled variation as possible. Using children also would have raised problems associated with hiring minors.

Test Administration

3.1 Procedures

Following drafting of the experimental design, Abt Associates Inc. staff members conducted several informal pretests with personnel at their headquarters. The procedures were further tested at Hogan's Alley with 17 sworn officers as pretest subjects. The pretests at Hogan's Alley involved the same staff, logistics, and times of day as the full study. These pretests also served as a test of the training design for instructing the role players in their responsibilities. Pretest data suggested that early exposure to the toy guns might condition some officers against firing subsequently in the presence of a "real" gun. The test design and training plan were slightly revised to test this hypothesis in the experiment.

Figure 1 presents the site plan of Hogan's Alley. The two test locations are shown, together with the route that each test subject followed during the eight confrontations. The test subjects reported to a classroom, where they recorded their department, rank, and years of experience as a sworn officer. The test subjects were not told the purpose or nature of the test. However, they were instructed to behave as they normally would under real-life conditions, <u>except that they were not to seek cover</u> during the confrontations.

The officers were asked to step outside the classroom one at a time, where they read a one page set of instructions. (See appendix D.) The instructions informed the officers that they were

... responding to a call from your dispatcher to investigate a reported prowler armed with a handgun... Someone will come out from the alleyway onto the sidewalk and point a weapon at you. If you feel your life is in danger, fire the revolver. (emphasis in the original)

Each subject was then escorted to location 1, where he or she was positioned on the test point. The subject was instructed to call out "Ready!" when prepared to start the test. The subject was also instructed to come to the "ready-gun position" with his or her revolver positioned at the hip, barrel parallel to the ground, finger on the trigger.

The armed assailant, upon hearing the ready call, appeared from the alley carrying the appropriate test weapon at his side nearest the test subject, pointing the

7







weapon toward the ground. The assailant walked onto the sidewalk with his left side toward the subject, moving into view at a normal pace. Upon reaching the designated test point, the assailant turned toward the subject, raised the weapon to the aim point, and pulled the trigger. Role players were rehearsed in this sequence until the procedure (walk out, turn, aim, and "fire") was consistently completed within 1.75 to 2.25 seconds.

There were eight confrontations. After each confrontation, the role player returned to the alley, picked up another test weapon based on a predeveloped selection protocol (see section 3.2 and appendix I), and walked out again onto the sidewalk. Pretest data indicated that officers quickly learned what to expect in each trial. To control the learning effect, location was changed after the third trial so that the fourth confrontation would be slightly unfamiliar. Specifically, the above confrontation situation was repeated three times in one location, following which the test subject was escorted to a second location. Here, the test subject was exposed to five confrontations, identical to those at location 1. A seventh and eighth confrontation were added because they could not adversely affect former trials, yet could provide useful data.

After each confrontation, the role players recorded on a Test Evaluation Form (appendix E) whether the officer "fired" his or her weapon and, if so, whether it was fired before or after the role player squeezed the trigger on his pistol. If the test subject fired at the same time as the role player, this was recorded as "officer fired before you."

Role players determined whether and when the test subjects fired by listening to the fall of the hammer on the officer's weapon. Because two tests were usually being conducted simultaneously and in close proximity, a relatively quiet response from the officer was needed to avoid intersubject contamination. Role players reported that they had no difficulty in recognizing whether the officers had actually fired. However, to avoid any potential confusion of sounds, role players squeezed-but did not fully pull--the trigger on their own weapons.

Upon completion of all eight confrontations, the test subject was escorted back to the classroom. The test subject was asked to read a confidentiality request (appendix F) designed to discourage the spread of information about the test to other law enforcement officers who might be future test subjects. When time permitted, test subjects were debriefed on their reactions to the test and the reasons they responded the way they did.

3.2 Bias Control

The simulation conditions were designed to minimize bias due to learning effects. Each officer was limited to eight trials because it was anticipated that any subsequent exposures would be substantially biased by learning. The eighth trial was used only to measure possible conditioning bias. The location was changed after the third trial to test whether a change of location would interrupt the learning curve.

Pretest results indicated that officers could be expected to react differently to the first presentation of a toy pistol-than to subsequent presentations, as they learned more about what to expect of the role player. The actual test results showed that officers were significantly more likely to fire at the first pistol they saw in each location than at subsequent pistols presented in the same location. To eliminate bias from this effect, with one exception each pistol was displayed equally often in the first and each subsequent trial. (To test the possibility that exposure to the toy guns conditioned officers against firing, the eighth and final trial always involved a "real" unmarked replica weapon.)

In addition, to reduce the possibility that officers would be conditioned too quickly to look specifically for toys in the confrontations, each officer saw weapons bearing only two of the four marking standards added by Department of Commerce regulation, all of which were more easily recognized than the orange plug inserted in the barrel. The order of presentation of these two standards was so arranged that each standard was paired about equally often with each of the remaining three, and was seen as the first of the pair about half the time.

Because the exact number of test subjects was unknown in advance, an exactly balanced design in which trials were equally divided among all possible marking combinations was impractical. However, the results indicate that all of the conditions of a balanced design were approximately met. Moreover, except for the difference between the first and subsequent trials in which each officer participated, learning effects are small compared to differences between marking standards. The order of presentation seemed to affect the responses to each marking about equally, so that the combined results of all trials fairly represent average conditions.

3.3 Test Realism

Illumination on the toy pistols was intended to simulate ordinary outdoor conditions. The tests were conducted on three successive late afternoons and evenings using a combination of naturally occurring light and the street and building illumination described in the previous section. Approximately one third of the test subjects were tested after sundown, when the illumination on the role players at each location was less than ten lux. Another third of the tests were conducted as the sun was setting, yielding illuminations between 10 and 200 lux. The remaining third were at illuminations ranging from 200 to approximately 700 lux, mostly in indirect sunlight or light overcast conditions. Figure 2 shows the exact measured light conditions on each of the three test days. On one of the test days (June 6), light rain was falling during half the tests. Testing was halted during periods of heavy rain, but resumed when the rainfall lessened.

Throughout the experiments, efforts were made to create test subject stress. These attempts ranged from driving the subject to the first test location at high speeds consistent with a "man with gun" response, to walking briskly to the test location when escorting the test subject on foot.

The arrival of each test subject at the confrontation location was delayed until the previous test subject had completed the sequence and left the area. Thus, test subjects never viewed the tests of other test subjects, although they sometimes heard the verbal commands made by other officers. The weapons used by the test subjects were unloaded blank firing revolvers, so that the other test subjects could not hear the actual responses of their predecessors.

The initial test was designed with the intention that all the test subjects were to be FBI National Academy students (the vast majority of whom are sworn State and local officers). With this expectation in mind, the Academy's Practical Applications Unit arranged to have Academy instructors distribute to their classes a handout describing the toy gun markings. (See appendix G). The instructors were asked not to mention the upcoming test. The handout and silence about the test were intended to simulate actual field conditions in which law enforcement officers might be provided information on the toy gun marking systems by their departments and then have to spontaneously remember the nature of the markings during any subsequent confrontations with an armed suspect.

In order to involve local law enforcement, police officers and deputy sheriffs from several neighboring communities were also recruited as test subjects. Unlike the National Academy students, these local law enforcement officers arrived with varying levels of knowledge about the nature of the test. While a few appeared to know the test's exact purpose, most reported they only knew that they would be participating in some type of unspecified simulated combat situation.

Figure 2

June 6 1,000 ۵ ۰ ۵ +4 Ø 100 Lux (log sode) 10 1 ۵ ٦ 00 0 07:12 07:40 08:43 03:09 08:33 00:07 09:38 d Location 1 ÷ Location 2 June 7 1,000 + +... Pao + 0 = +003 + e^{pe} 0 100 s 5⁰ Lux (log socie) 10 9000000000 1 02:21 08:00 08:28 08:57 37:28 07:56 03:24 08:52 ٥ ŧ Laastion 2 Location 1







3.4 Test Subjects

Eighty-nine law enforcement officers participated in the test. Three of the subjects were eliminated from the analysis because the role players believed they did not understand the test procedure, leaving 86 subjects whose data were used in the analysis.

Fifty-eight percent of the test subjects were line police officers; 19 percent were sergeants; and 16 percent held a rank of lieutenant or higher (table 1). One subject identified himself as a "director," and one subject was an FBI Special Agent. Four subjects were from Canada or other foreign countries.

Table 2 shows that 78 percent of the test subjects had been sworn officers for four years or more and 10 percent for at least 20 years. Only three test subjects had less than two years experience as sworn officers.

Table 1

Number and Percentage of Test Subjects by Rank

Rank	number of subjects			
Line Police Officer	50	58%		
Sergeant	16	19		
Lieutenant	8	9		
Captain	3	3		
Major	1	1		
Chief	2	2		
Other and foreign	6			
TOTAL	86	100%		

Table 2

Number and Percentage of Test Subjects,* by Years as Sworn Officer

Years as Sworn Officer	number o	of subjects*		
1		3	4%	
2-3		15	18	
4-9		15	18	
10-19		41	50	
20-25		_8	10	
TOTAL		82	100%	

* Excludes four foreign officers.

4 Test Results

Eighty-nine law enforcement officers participated in the test. Three officers who appeared not to understand the directions were excluded from the analysis. The data obtained from the remaining 86 test subjects provided a total of 687 separate trials.¹ In 284 instances, the role player was armed with an exact, unmarked replica of a real pistol. In 403 instances he was armed with a toy or imitation pistol marked according to one of the five standards provided by statute or regulation. When a toy pistol was used, it was either marked according to the single standard stipulated by Congress--a blaze orange plug in the muzzle (201 instances), or it was marked using one of the four standards (orange band, bright color, white, and transparent/translucent) added by the Department of Commerce regulation (202 instances).

Tables 3, 4, and 5 and figure 3, summarize the combined responses on all trials. Role players holding unmarked replica pistols or those marked with the orange plug were fired at more than 95 percent of the time. Role players holding the transparent green plastic squirt gun were fired at on one-third of the trials. Other markings resulted in intermediate levels of response. Specifically, the black plastic squirt gun with an orange band around the exterior of the barrel caused the test subjects to fire significantly more often (about three times in four) than other conspicuously marked toy handguns. The white handgun and the orange/purple handgun caused test subjects to fire about equally often (59 percent and 56 percent, respectively).

Experimental factors in addition to pistol markings influenced the outcomes of the trials. For example, as shown in figure 4, shooting was significantly more likely to occur on the first trial at each location. (In an actual combat situation, this would be the only encounter.)

A detailed breakdown of responses in terms of whether and when the test subjects "fired" by weapon marking, illumination, and distance may be found in appendix H. Test results by trial sequence and test weapon may be found in appendix J.

4.1 Analytic Approach

The research design was intended to provide substantially larger sample sizes for "real" pistols and imitation weapons marked with the orange plug than for weapons

¹There should have been 688 trials (8 confrontations x 86 test subjects), but the response to one trial was accidentally not recorded.

Table 3

		Distance	
	All	15 Feet	30 Feet
"Real" gun	98%	98%	98%
Orange plug	96%	97%	95%
Orange band	77%	81%	74%
White	59%	81%	48%
Orange/purple	56%	59%	55%
Clear green	33%	15%	45%

Percentage of Trials in Which Test Subjects Fired, by Type of Weapon Marking and Distance from Role Player

Table 4

Standard Errors of Percentages Reported in Table 3

		Distance	
	All	15 Feet	30 Feet
"Real" gun	1%	1%	1%
Orange plug	1%	2%	2%
Orange band	6%	9%	8%
White	7%	10%	9%
Orange/purple	7%	12%	9%
Clear green7%	8%	9%	

Table 5

Number of Trials

		Distance				
	All	15 Feet	30 Feet			
"Real" gun	284	112	172			
Orange plug	201	71	130			
Orange band	52	21	31			
White	49	16	33			
Orange/purple	50	17	33			
Clear green	51	20	31			

Figure 3

ŝ

.

Percentage of Trials in Which Test Subjects Fired, by Type of Handgun and Distance from Role Player (n=86)

All eight trials combined



Figure 4

Percentage of Test Subjects Who Fired by Sequence of Trials and Distance from Role Player

average of four toy handguns



The first three trials (Location One) were conducted at 15 feet from the test subject. The next four trials (Location Two) were conducted at 30 feet. An eighth trial at Location Two involved only "real" guns. For each trial, the figure shows the percent of subject officers who fired at one of the four marked toy handguns, averaged over the four conspicuous marking systems. A total of 202 trials were conducted using these four markings. with the other four classes of toy markings, so that small differences between responses to "real" pistols and those marked with the orange plug could be detected. Even with this large sample, however, so little variation was observed in response to either the real or the orange plugged pistols that detailed statistical modeling was pointless. Because the results with these weapons were nearly constant, they were instead analyzed separately from the results with the other weapon. Each trial in which these two types of weapons <u>did not</u> precipitate a shooting was individually examined. These incidents are discussed below under "Findings."

Conventional statistical models were applied to the smaller samples of four conspicuous markings added by Department of Commerce regulation. Differences among markings were tested for significance in a multivariate repeated measures analysis of covariance with each officer's responses to the two toy markings he or she observed as the two dependent measures and the identity of the markings as independent variables. This joint analysis of the two responses was selected instead of univariate ANOVA because it estimates smaller statistical errors by taking into account the correlation between the two responses made by each officer.² (At the request of the National Institute of Justice, univariate ANOVAs were also done, treating each trial as a separate case. See Appendix H for results.)

Light, weather, distance, and order of presentation were entered as covariates. Light levels were measured once or twice per hour. Readings for tests conducted between measurements were linearly interpolated from these measurements. Logarithmic and polynomial transforms of light levels were used to test for nonlinear responses. Distance was a dichotomy: all observations took place at either 15 or 30 feet. Distance and order of presentation were necessarily confounded in the design: every test subject was observed first for three trials at 15 feet and subsequently for the fourth through eighth trials at 30 feet. Thus there is some ambiguity in the meaning of the term "distance." Two linear variables representing distance and order of presentation were always treated jointly in the models.

Separate univariate regressions were performed on the individual responses to each type of marking using the same variables. Effects which appeared significant or approached significance in these models were tested in a loglinear contingency table

²Because the dependent variable is dichotomous, the classical assumptions of ANOVA cannot hold. In our experience, a more rigorous approach--such as a probit or logic--seldom yields findings that differ from the ANOVA, however. Consequently, we have used ANOVA, which is computationally simpler.

analysis. In general, because only about 50 observations were available for each of the four toy pistol marking standards, only very large differences could be detected as statistically significant. (For example, the tests we used would have only 50 percent power to detect difference of 30 percentage points between two conditions for a single marking. Null findings should therefore not be regarded as indicating the absence of an effect, but only that this experiment did not produce information indicating a difference. Substantially larger samples would be required to uncover more structure in the data.

4.2. Findings

Below, the results of the analysis are presented separately for the imitation handguns and the toy handguns. Complete data sets may be found in appendix J.

4.2.1 Imitation (Replica) Handguns

The only marking standard provided by Public Law 100-615 (The Federal Energy Management Improvement Act of 1988) is under Section 4(b)(1), which states

... each toy, look-alike, or imitation firearm shall have as an integral part, permanently affixed, a blaze orange plug inserted in the barrel of such toy, look-alike, or imitation firearm. Such plug shall be recessed no more than 6 millimeters from the muzzle end of the barrel of such firearm. (See appendix A.)

UNDER THE CONDITIONS REPRESENTED BY THE EXPERIMENTAL TEST, PISTOLS WITH THIS MARKING ARE PRACTICALLY INDISTINGUISHABLE FROM A REAL PISTOL.

Each participating test subject saw either two or three .45 caliber automatic pistols marked with orange plugs. Combining all trials, the 86 law enforcement officers were confronted by a role player wielding a pistol marked with an orange plug on 201 occasions. The officers fired at the role players holding these marked pistols 193 times (96 percent). Fire was withheld on only 8 occasions involving an imitation pistol with an orange plug.

These 8 cases of fire withheld seemed to be explained partly by the officers' reluctance to shoot under any conditions. THREE OF THE SEVEN OFFICERS WHO AVOIDED SHOOTING THE MARKED PISTOLS ALSO FAILED TO SHOOT WHEN CONFRONTED BY A ROLE PLAYER. WHO WAS ARMED WITH A "REAL" PISTOL. This is a far higher failure rate than the average for other officers (p < .01 by Fisher's exact test).

The test subject's overall willingness to fire when a role player used an unmarked replica pistol was the only observed factor which was systematically related to whether the officer fired when a marked replica was used. Factors which did not appear to strongly affect the decision to fire when confronted by a test subject carrying a pistol marked with the orange plug include:

- distance from the observer (2 of the 8 occurred at 15 feet, 6 at 30 feet)
- learning (2 each occurred in the first trial at location one, the first trial at location two, and the third and fourth trials at location two)
- light or weather conditions (one occurred at night, one in the rain)
- the role players portraying the suspects (4 different role players were involved).

4.2.2 Toy Handguns

THE RESPONSES TO THE FOUR MARKINGS USED ON THE PLASTIC SQUIRT GUNS ARE SIGNIFICANTLY DIFFERENT.

Combining the responses on all trials, role players holding a transparent green plastic squirt gun were fired at on one third of the trials. The black plastic squirt gun with an orange band around the exterior of the barrel caused test subjects to fire significantly more often than other toy weapons (about three times in four). The white handgun and the orange/purple handgun caused the officers to fire about equally often (59% and 56%, respectively). This pattern of results remained approximately unchanged when the initial trial was excluded. The observed differences are statistically significant.

Multivariate repeated measures tests of the effect of marking type showed significantly different firing rates for the four toy handgun marking types. (F = 1.88 with 12 and 156 degrees of freedom; p<.05) Individual markings were tested against the average of all others. The realistically colored squirt gun with an orange plastic band around the tip of the barrel scored significantly worse than the average of the three others (t = 2.45; p < .01). The clear green squirt gun is significantly better (t = -1.74; p < .05). The other two marking standards (white and bright color) are intermediate between these, and not significantly distinguishable from each other.

Police officers differed significantly from one another in the overall rate at which they fired at role players armed with toy pistols. Excluding the initial trial, each officer saw two different toy pistols, each marked according to one of the four standards added by the Department of Commerce regulation. The response to the second toy weapon was correlated to the response to the first (r = .37, p < .001), implying that about 14% of the total variation in outcome was due to the officer's general propensity to shoot at any weapon, as opposed to variation due to the markings of the pistol or environmental factors. About 40 percent of the officers fired at every pistol they saw, regardless of markings. Some of these test subjects later explained that they were attending primarily to the behavior of the role player; when they saw him continue to disregard their orders, they assumed he was a threat regardless of what he might be holding.

THE DIFFERENCES AMONG THE FOUR SQUIRT GUN MARKINGS ARE RELATIVELY UNINFLUENCED BY EXPERIMENTAL FACTORS.

Analytic tests of measured conditions which might have affected visibility were not generally found to be significant factors in recognition in this sample. Night and rain did not seem to affect the test results in any systematic way. (Only a few tests were conducted under these conditions, so only very large differences could be detected.) The one exception is the clear green pistol; the role players using this handgun were significantly less likely to be fired at when they were 15 feet away from the officer than when they were 30 feet away. As shown in figure 5, the clear green handgun caused test subjects to fire in only 3 of 20 trials (15 percent) at 15 feet, but it caused them to fire in 17 out of 30 trials (45 percent) at 30 feet.

4.3 Comments

State and local police are trained to use their weapons only as a last resort, when they believe that their own lives or those of other innocent persons are in jeopardy. The mere presence of a weapon puts the officer on notice that he or she is potentially a target of aggression. Consequently, it is not surprising that officers who participated in this experiment frequently fired at the role player in self-defense unless it was obvious that the weapon was a toy, as was the case with the transparent water pistol.

Failure of the role player to respond to the command, "Police! Don't Move!" appeared to prompt many officers to fire. In debriefings, several officers said they felt they had to fire at anyone who aimed a weapon at them and failed to obey this command, regardless of the marking on the weapon. Some officers reported that they Figure 5

Percentage of Test Subjects Who Fired When the Transparent Green Squirt Gun Was Used

> Thirty Feet from Subject (Location Two)



fired even when they realized that the weapon was a toy because they felt that any suspect could paint a real handgun to look like a toy.

Whether the attitude, "I cannot take chances with an individual pointing a firearm at me," would have persisted if the test subjects were told in advance that certain weapons would be toy guns is not known. An academy volunteer who withheld fire when the pistol with the orange band was used stated that if he had not received and read the handout describing the fire marking system, he would have fired.

After completing the test, a number of test subjects were asked what motivated them to fire or hold fire when confronted with the toy weapons. Several test subjects reported they fired when confronted with the pistol marked with an orange plug in the barrel because they could not see the plug until the role player was pointing the pistol directly at them, and they had already fired. Several law enforcement officers who participated after dark reported that they never saw a single weapon with an orange plug or an orange band, even though the test exposed every test subject to two or three weapons marked with the orange plug.

Officers who fired when confronted with the white toy pistol said it looked like a real weapon that was made of stainless steel or was nickel plated, particularly in the dark. One test subject said that some real weapons are painted a metallic color.

These comments indicate that many officers' decisions to shoot were based on the behavior of the role player displayed in this specific experiment. Under a more relaxed set of conditions, many officers might have been less likely to fire or might have waited longer before deciding to fire. The instructions, too, probably influenced the shooting rate. For example, the instructions said, "If you feel your life is in danger, fire the revolver." A change in wording to, "Do not fire unless you feel your life is in danger," might have resulted in a lower firing rate. Similarly, a scenario in which officers had the time and opportunity to take cover might have made a more accurate threat assessment and better discrimination of the markings possible. Learning effects seemed to produce lower shooting rates, suggesting that increased familiarity with the marking systems, training, and better information for officers responding to calls might improve the effectiveness of the marking systems.

However, the vast majority of the comments obtained during the debriefings refer to the general conditions of the confrontation, rather than to specific markings. This suggests that while changing the experimental conditions might have resulted in more or fewer shootings, the relative rankings of the markings would remain approximately those observed here. For example, under a different experimental protocol, the green transparent marking would probably not have a failure rate of exactly 33 percent, as it did in this experiment, but it almost certainly would perform better than any of the other markings. Similarly, the weapons marked with small orange plugs or bands of orange color might not experience exactly the same shooting rates that were observed in this experiment, but they would probably result in significantly higher rates than weapons with the other markings.

5 Conclusions

Under the conditions measured by this simulation, the orange plug marking standard completely failed to enable the test subjects to identify the weapon as a toy gun. All the other marking standards were recognized by some officers, but the recognition rate varied significantly among the different markings. The realistically colored pistol marked with an exterior orange band was infrequently recognized. The green transparent marking and, to a lesser degree, the white and brightly colored orange/purple markings were effective in enabling many test subjects to identify the weapons as a toy gun, particularly when the officers did not feel that the role player's general behavior (i.e., refusing to "freeze") required them to fire.

The primary factors influencing recognition of individual markings were the officer's familiarity with the setting (as indicated by the order of presentation) and the officer's general willingness to shoot (measured by the correlation between responses to the first and second toy handgun). Physical experimental conditions such as distance and lighting were less influential.

At least one test subject who successfully identified test weapons as toy handguns reported he did so as a consequence of handout material that made him aware of marking systems for toy weapons. On the average, clearly marked toy guns were most likely to provoke shootings on the first trial, and less likely after police officers gained some familiarity with the situation and the possible appearance of toy guns. This suggests that the effectiveness of marking systems in preventing injury will be increased if state and local law enforcement agencies know what the markings are. It would be desirable if their officers were shown samples of properly marked handguns to become thoroughly familiar with those markings. Likewise, private citizens, particularly employees, such as clerks or bank tellers, likely to be exposed to criminal acts involving toy guns, should also be made aware of the marking systems.

Appendices

Appendix A

Public Law 100-615

The Federal Energy Management Improvement Act of 1988 Section 4

SEC. 4. PENALTIES FOR ENTERING INTO COMMERCE OF IMITATION FIRE-ARMS,

(a) It shall be unlawful for any person to manufacture, enter into commerce, ship, transport, or receive any toy, look-alike, or imitation firearm unless such firearm contains, or has affixed to it, a marking approved by the Secretary of Commerce, as provided in subsection (b).

(b)(1) Except as provided in paragraph (2) or (3), each toy, lookalike, or imitation firearm shall have as an integral part, permanently affixed, a blaze orange plug inserted in the barrel of such toy, lock-alike, or imitation firearm. Such plug shall be recessed no more than 6 millimeters from the muzzle end of the barrel of such firearm.

(2) The Secretary of Commerce may provide for an alternate marking or device for any toy, look-alike, or imitation firearm not capable of being marked as provided in paragraph (1) and may waive the requirement of any such marking or device for any toy, lookalike, or imitation firearm that will only be used in the theatrical, movie or television industry.

(3) The Secretary is authorized to make adjustments and changes in the marking system provided for by this section, after consulting with interested persons.

(c) For purposes of this section, the term "look-alike firearm" means any imitation of any original firearm which was manufactured, designed, and produced since 1898, including and limited to toy guns, water guns, replica nonguns, and air-soft guns firing nonmetallic projectiles. Such term does not include any look-alike, nonfiring, collector replica of an antique firearm developed prior to 1898, or traditional B-B, paint-ball, or pellet-firing air guns that expel a projectile through the force of air pressure.

(d) The Director of the Bureau of Justice Statistics is authorized and directed to conduct a study of the criminal misuse of toy, lookalike and imitation firearms, including studying police reports of such incidences and shall report on such incidences relative to marked and unmarked firearms.

(c) The Director of National Institute of Justice is authorized and directed to conduct a technical evaluation of the marking systems provided for in subsection (b) to determine their effectiveness in police combat situations. The Director shall begin the study within 3 months after the date of enactment of this section and such study shall be completed within 9 months after such date of enactment.

(f) This section shall become effective on the date 6 months after the date of its enactment and shall apply to toy, look-alike, and imitation firearms manufactured or entered into commerce after such date of enactment.

(g) The provisions of this section shall supersede any provision of State or local laws or ordinances which provide for markings or identification inconsistent with provisions of this section provided that no State shall—

(i) prohibit the sale or manufacture of any look-alike, nonfiring, collector replica of an antique firearm developed prior to 1898, or

(ii) prohibit the sale (other than prohibiting the sale to minors) of traditional B-B, paint ball, or pellet-firing air guns that expel a projectile through the force of air pressure.

Approved November 5, 1988.

Federal Register / Vol. 54, No. 85 / Friday, May 5, 1989 / Rules and Regulations

CHAPTER XI-TECHNOLOGY ADMINISTRATION, DEPARTMENT OF COMMERCE

PART 1150-MARKING OF TOY, LOOK-ALIKE AND IMITATION FIREARMS

Sec.

1150.1 Applicability.

1150.2 Prohibitions.

1150.3 Approved markings.

1150.4 Waiver.

1150.5 Preemption

Authority: Section 4 of the Federal Energy Management Improvement Act of 1986, 15 U.S.C. 5001.

§ 1150.1 Applicability.

This part applies to toy, look-alike and imitation firearms ("devices") having the general appearance, shape, and/or configuration of a firearm and produced or manufactured and entered into commerce on or after May 5, 1989. including devices modelled on real Erearms manufactured, designed, and produced since 1898. This part does not apply to any toy, look-alike, or imitation Brearm that is a non-firing replice of an antique firearm modelled on a real firearm designed, manufactured, and produced prior to 1898, nor to traditional B-B, paint-ball, or pellet-firing air guns that expel a projectile through the force of compressed air, compressed gas or mechanical spring action, or any combination thereof, as described in American Society for Testing and Materials standard F 589-85, Standard Consumer Safety Specification for Non-Powder Guns, June 28, 1985. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103. Copies may be inspected at the office of the Associate Director for Industry and Standards, National Institute for Standards and Technology, Gaithersburg, Maryland, or at the Office of the Federal Register, 1100 L Street, NW., Room 8401, Washington, DC.

§ 1150.2 Prohibitions.

No person shall manufacture, enter into commerce, ship, transport, or receive any toy, look-alike, or imitation firearm ("device") covered by this Part as set forth in § 1150.1 of this part unless such device contains, or has affixed to it, one of the markings set forth in § 1150.3 of this part, or unless this prohibition has been waived by § 1150.4 of this part.

§ 1150.3 Approved markings.

The following markings are approved by the Secretary of Commerce:

(a) A blaze orange (Federal Standard 595a, February, 1987, color number 12199, issued by the General Services Administration) solid plug permanently affixed to the muzzle and of the barrel as an integral part of the entire device and recessed no more than 8 millimeters from the muzzle end of the barrel. This incorporation by reference was approved by the Director of the Federal Resister in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies of Federal Standard 595a may be obtained from the Office of Engineering and Technical Management, Chemical Technology Division, Paints Branch, General Services Administration, Washington DC 20408. Copies may be inspected at the office of the Associate Director for Industry and Standards, National Institute for Standards and Technology, Gaithersburg, Maryland, or at the Office of the Federal Register. 1100 L Street, NW., Room 8401, Washington DC.

(b) For any water gun, sir-soft gun, light-emitting gun or other ejecting toy. look-alike or imitation firearm having an opening to discharge such things as water, non-metallic projectiles, and light, a blaze orange (Federal Standard 595a, February, 1987, color number 12189, issued by the General Services Administration) marking permanently affixed to the exterior surface of the barrel, covering the circumference of the barrel from the muzzle end for a depth . of at least 6 millimeters. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S C. 552(a) and 1 CFR Part 51. Copies of Federal Standard 595a may be obtained from the Office of Engineering and Technical Management, Chemical Technology Division, Paints Branch, General Services Administration, Washington, DC 20408. Copies may be inspected at the office of the Associate Director for Industry and Standards, National Institute for Standards and Technology, Gaithersburg, Maryland, or at the Office of the Pederal Register, 1100 L Street, NW., Room 8401, Washington, DC.

(c) Construction of the device entirely of transparent or translucent materials which permits unmistakable observation of the device's complete contents.

(d) Coloration of the entire exterior surface of the device in bright red. bright orange, bright yellow, bright green, or bright blue, either singly or as the predominant color in combination with other colors in any pattern. (e) Coloration of the entire axterior surface of the device predominantly in white in combination with one or more of the colors bright red, bright orange, bright yellow, bright green, or bright blue in any pattern.

§ 1150.4 Walver.

The prohibitions set forth in § 1150.2 of this part are waived for any toy, lookalike or imitation firearm that will be used only in the theatrical, movie or - television industries.

§ 1150.5 Preemption.

In accordance with section 4(g) of the Federal Energy Management Improvement Act of 1988 (15 U.S.C. 5001(g)), the provisions of section 4(a) of that Act and the provisions of this part supersede any provision of State or local laws or ordinances which provides for markings or identification inconsistent with the provisions of section 4 of that Act or the provisions of this part.

[FR Doc. 89-10758 Filed 5-4-89; 8:45 am]



Appendix B

U.S. Department of Commerce Final Rule on Toy Firearm Markings

Federal Register / Vol. 54; No: 86 / Friday, May 5, 1989 / Rules and Regulations

Technology Administration

15 CFR Part 1150

19358

[Docket No. 90248-9104]

Marking of Toy, Look-Allke and Imitation Firearms

AGENCY: Technology Administration, Commerce.

ACTION Final rule.

SUMMARY: The Technology Administration of the United States Department of Commerce is today issuing a final rule to implement section 4 of the Federal Energy Management Improvement Act of 1988 ("Act") (Pub L. 100-615) which prohibits the manufacturing, entering into commerce, shipping, transporting, or receipt of any toy, Imitation or look-alike firearm ("device") unless such device contains. or has affixed to it, a marking approved by the Secretary of Commerce. The final rule maintains the method of marking established by section 4(b)(1) of the Act and establishes an alternative method of marking when a device is not capable of being marked by the method established by section 4(b)(1) and three alternative methods of marking which may be used in all instances. In addition, the rule waives marking requirements for any toy, look-elike, or imitation firearm that will be used only in the theatrical, movie, or television industries. DATE This rule is effective May 5, 1989. The incorporation by reference of certain publications listed in the regulations is approved by the Director of the Federal Register as of May 5.

FOR FURTHER DEFORMATION CONTACT: Dr. Stanley L Warshaw, Associate Director for Industry and Standards, National Institute of Standards and Technology, telephone number [301] \$75-4000, FAX [301] \$26-0647.

1989.

EUPPLEMENTARY INFORMATION: Section 4(a) of the Federal Energy Management Improvement Act of 1988 provides that "it shall be unlawful for any person to manufacture, enter into commerce, ship, transport, or receive any toy, look-alike, or imitation firearm unless such firearm contains, or has affixed to it, a marking approved by the Secretary of Commerce • • •." (15 U.S.C. 5001(a).) Section 4(b)(1) of the Act establishes as an initial acceptable marking a permanently affixed, blaze orange plug inserted in the barrel of the toy, lookalike, or imitation firearm, recessed no more than 6 millimeters from the muzzle end of the barrel, and made an integral part of the device. (15 U.S.C. 5001(b)(1).) Section 4(b)(2) authorizes the Secretary

to approve an alternative marking for any toy, look-alike, or imitation firearm not capable of being marked with the requisite blaze orange plug, and to waive the marking requirements for any toy, look-alike, or imitation firearm that will only be used in the theatrical, movie or television industries. (15 U.S.C. 5001(b)(2).) Section 4(b)(3) authorizes the Secretary to adjust or change the marking system established pursuant to sections 4(b) (1) and (2), after consultation with interested persons. (15 U.S.C. 5001(b)(3).)

The Technology Administration held a public workshop at the National Institute of Standards and Technology on February 9, 1966, on the marking requirements of the Act. (See 53 FR 50987, Dec. 19, 1998.) The workshop was attended by forty representatives of trade associations, manufacturers, importers, distributors and Federal Agencies. Many attendees brought samples of toy, look-aliks or imitation firearms. Although not requested, written comments were received in advance and subsequent to the workshop.

Based on the comments received and consultations at the workshop and elsewhere with trade associations, manufacturers, importers, distributors, collectors, retailers, police chiefs, and Federal Agencies, the Under Secretary for Technology published a Notice of Proposed Rulemaking in the Federal Register on March 14, 1989 (54 FR 10550). The notice proposed to maintain the blaze orange plug marking established by section 4(b)(1) of the Act and establish as an alternative marking system for water guns, air-soft guns, light emitting guns or other ejecting toy. look-alike or imitation firearms which. as such, cannot be marked with a plugin the muzzle and of the barrel because it would restrict the opening necessary to discharge such things as water, nonmetallic projectiles, and light, a blaze orange marking permanently affixed to the exterior surface of the barrel and covering the circumference of the barrel and extending from the muzzle end for a depth of at least 8 millimeters. The notice also proposed to adjust the statutory marking system by permitting three other methods of marking for use in the alternative irrespective of whether the device could be marked with the blaze orange plug or blaze orange muzzle marking. The three sitematives proposed were to mark the device at manufacture by:

(1) Constructing it entirely of transparent or translucent materials which permit unmistakable observation of the device's complete contents; (2) permanently coloring the entire exterior

surface of the device bright red, bright_ orange, bright yellow, bright green, or bright blue, either singly or as the predominant color in combination with other colors in any pattern; or (3) permanently coloring the entire exterior surface of the device predominantly in white in combination with one or more of the colors bright red, bright orange, bright yellow, bright green, or bright blue in any pattern. These alternatives were selected because they represent standard industry practice for most toy. look-alike and imitation firearms and in the opinion of those consulted, are sufficient to identify the device as a toy, look-alike, or imitation firearm rather than as a real firearm. Finally, the notice proposed to waive marking requirements for any toy, look-alike or imitation firearm that will only be used in the theatrical, movie or television industries.

Section 4(c) of the Act specifically excludes from the Act's marking requirements or any marking requirements established thereunder look-alike, non-firing, collector replicas of antique firearms designed, manufactured, and produced prior to 1898, and traditional B-B, paint-ball, or pellet-firing air guns that expel a projectile through the force of air pressure. (15 U.S.C 5001(c).) However, it is clear from the legislative history of section 4 that it was the intent of Congress to also exclude from marking requirements traditional B-B, paint-ball, and pellet-firing air guns that expel a projectile through the force of compressed gas or mechanical spring action, or a combination thereof. Accordingly, the notice proposed to exclude from marking requirements lock-alike, non-firing, collector replicas of antique firearms designed. manufactured, and produced prior to 1898, and traditional B-B, paint-ball, or pellet-firing air guns that expel a projectile through the force of compressed air, compressed gas or mechanical spring action, or any combination thereof.

In response to the March 14, 1989 Notice of Proposed Rulemaking, the Technology Administration received twenty-eight comments, five from manufacturers, vendors, or their representatives or attorneys; ten from police officials at various levels of government; four from State legislators and executive officials; seven from interested members of the public; and two from elements of the U.S. Government. Eight of the commenters fully supported the regulation, thirteen supported the regulation but recommended changes, four took the





Federal Register / Vol. 54, No. 88 / Friday, May 8, 1989 / Rules and Regulations

position that a total ban on realistic toy guns was necessary and therefore opposed the regulation as too weak, and three took no position.

The two most frequent comments about the regulation were, first, that the marking requirements should be changed to eliminate the recessed orange plug as an acceptable marking. and second, that a complete ban on realistic toy guns was needed. Eight commenters raised the first issue and five raised the second. No changes are being made to the regulations at this time as a result of either comment. The Technology Administration is awaiting the results of a study by the Director of the National Institute of Justice, mandated by section 4(c) of the Act before deciding whether to remove the recessed orange plug as an acceptable marking. That sindy is a technical evaluation of the marking system established by the Act and of the alternative marking systems being implemented by this regulation. The Act requires that study to be completed within nine months of snaciment, or no later than August 5, 1989. With respect to the comments requesting a complete ban on realistic toy guns, the Secretary of Commerce has no authority under the Act to take such action.

Other comments received are described below, listed by commenter. Among the five manufacturers, vendors, and their representatives, all generally supported the methods of marking contained in the proposed regulation. However, three requested changes in § 1150.1 "Applicability" of the regulation to make clear the intent of Congress that the regulation did not apply to toy, lookalike or imitation firsarms that are nonfiring replicas of an untique firearm modeled on a real firearm designed. manufactured, and produced prior to 1893. The final regulation has been revised to accommodate this request. One commenter requested an exemption from the regulations for sirguns and look-alike guns marketed to the adult buyer, another commenter requested that section 1150.5, dealing with preemption of marking requirements by state and local governments, be strengthened. These requested changes have not been made, because the Secretary of Commerce has no authority under the Act to make the requested

changes. Among the ten police officials, all generally supported the proposed regulation, although as discussed above. six of the ten questioned the effectiveness of a recessed orange plug

without additional marking. In addition, two of the ten commenters suggested the inclusion of BB guns and the like under the scope of the regulation. Because the exclusion of BB guns is statutorily mandated by section 4(c) of the Act, the requested change was not made.

Four comments were received from representatives of state governmants, three supporting the regulation and one opposing it. The Consumer Protection Ecard of one state fully supported the regulation, as did the Department of Human Resources of a second state. The **Consumer Council of a state Department** of Agriculture supported the alternative marking schemes, but questioned the utility of the recessed blaze orange plug. recommending elimination of that method of marking. One state Senator opposed the regulation, strongly supporting in its place a total ban on toy guns and look-slikes.

Seven comments were received from the general public, four generally supporting the regulation and three preferring a total ban on toy guns and look alikes. Finally, materials ware received from Senator Cranston of California and the National Institute of Justice, neither of which specifically commented on the regulation.

The final rule repeats the blaze orange plug method of marking established by the Act and repeats the preemption set forth in the statute. In all other respects it grants waivers and allows less restrictive methods of marking. Accordingly, since the rule thus grants or recognizes an exemption and relieves restrictions, under section 553(d) of the Administrative Procedure Act (5 U.S.C. 553(d)) it may and is being made effective without a 30 day delay in effective date.

Additional Information

Executive Order 12291

The Under Secretary for Technology has determined that this rule is not a major rule within the meaning of section 1(b) of Executive Order 12291 because it will not result in:

(1) An annual effect on the economy of \$100 million or more;

(2) A major increase in costs or prices for consumers, individual industries, Federal, state or local government agencies or geographic regions; or,

(3) Significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of U.S. based enterprises to compete with foreign-based enterprises in domestic or export markets.

Therefore, preparation of a Regulatory Impact Analysis is not required under Executive Order 12291.

Executive Order 12812

This rule does not contain policies with Federalism implications sufficient to warrant preparation of a Federalism assessment under Executive Order 12012.

1933

Executive Order 12372

This rule does not involve Federal financial assistance, direct Federal development, or the payment of any matching funds from a state or local government. Accordingly, the requirements of Executive Order 12372 are not applicable to this rule.

Executive Order 12630

This rule does not poss significant takings implications within the meaning of Executive Order 12830.

Regulatory Flexibility Act

The General Counsel of the Department of Commerce cartified to the Chief Counsel for Advocacy of the Small Business Administration at the time this rule was proposed that, if it ware adopted as proposed, it would not have a significant economic impact on a substantial number of small entities because the alternative markings conform to existing industry practices for most toy, look-alike, and imitation firearms, thus reducing the rule's impact to only where such practices are not followed. As a result, a Regulatory Flexibility Analysis is not required to be prepared under the Regulatory Flaxibility Act

Paperwork Reduction Act

This rule does not contain information collection requirements subject to the Paperwork Reduction Act.

National Environmental Policy Act

This rule will not significantly affect the quality of the human environment. Therefore, an environmental assessment or Environmental Impact Statement is not required to be prepared under the National Environment Policy Act of 1969.

List of Subjects in 15 CFR Part 1150

Commerce, Business and industry, Labeling, Hobbies, Imports, Exports, Shipping, Toys, Transportation, Freight, Incorporation by reference.

Les W. Mercer,

Deputy Under Secretary for Technology. Dated: April 28, 1969.

For reasons set forth in the preamble, Title 15, Subtitle B of the Code of Federal Regulations is amended by adding a Chapter XI, consisting of Part 1150, to read as follows:

Appendix C

Situational Characteristics of Incidents Involving Toy Guns

No national data source systematically identifies incidents involving toy guns. In order to characterize the risks associated with realistic toy guns, a content analysis was conducted of news reports on toy gun incidents retrieved through electronic searches of the <u>New York Times</u>, the <u>Washington Post</u>, and the <u>Los Angeles Times</u> between December 1985 and November 1988. Additional articles on incidents involving toy guns were provided by Barbier, Tolleson, Mead, Paige & Carlin (a law firm that represents Daisy Manufacturers), the New York State Senate, and the International Association of Chiefs of Police.

This selection process produces a biased sample of toy gun shooting incidents. Incidents occurring more than a few miles from the newspapers' place of publication are unlikely to be reported. Incidents resulting in death are much more likely to be published than those resulting in injury, and those resolved without injury are probably only rarely mentioned in the press. Further, incidents which happen frequently are not usually considered news unless they include some extraordinary aspect. As a result, the data presented below are not typical of any population. Nevertheless, they are sufficient to prove the existence of risks associated with toy gun use and suggest a typology of situations.

The Nature of the Problem

Table 1 summarizes significant characteristics of 41 incidents identified in the search. The table distinguishes between incidents in which toy guns were used in the commission of a crime and incidents without apparent criminal intent.

Table 1

Outcome of Toy Gun Incidents by Type of Use and Age of User (n=41)

		Guns	Used in Com	mmitting	a Crime	Guns L	lsed with No	o Crimina	i intent
		Âge				Age		pa. 27	
	ALL	AEL	Juvenile	Adult		ALL	Juvenile	Aduit	
A G	Uses	Ages	(<18)	(>=18)	Unknown	Ages	(<18)	(>=18)	Unknown
All Incidents	41	14	1	8	5	27	10	12	5
Deaths	20	8	1	5	2	12	5	4	3
Nonfatal Injuries	5	1	0	1	0	- 4	0	4	0
Police Involved	32	8	1	5	2	24	9	11	4

Criminal incidents. Criminal intent could be inferred in 14 of the 41 incidents (table 1). Among the 14 crimes, burglary and robbery (including attempts) were the crimes cited most frequently (eight incidents--data not tabulated). Four additional incidents involved a hostage situation. In one incident, a civilian threatening someone with a knife pulled out a toy gun when confronted by police. Finally, someone pointed a toy gun at an officer during a drug raid. Law enforcement officers were involved in at least eight of the incidents. A total of eight deaths and one non-fatal injury resulted from these 14 criminal incidents.

A larger sample of criminal incidents recorded in New York City provides additional evidence about the extent of toy handgun use to facilitate crime. In testimony before the New York State Senate Standing Committee on Crime and Corrections in 1988, an inspector from New York City reported that from 1982 to 1986 a total of 1,902 felony arrests were made involving a toy or imitation gun. Of these, 52 percent involved robberies. The New York City Police Department reported a total of 559 felony and misdemeanor complaints over the first 10 months of 1987. Again, obbery was the most frequent offense. In addition, only 2 percent of the suspects found in possession of a toy gun during the first 10 months of 1987 were under 13.

Since most law enforcement agencies do not routinely collect comparable data on toy gun use in the commission of crime, the precise magnitude of the problem nationwide is impossible to determine. This evidence only shows qualitatively that toy guns play a role in facilitating certain criminal activities.

Non-criminal incidents. Toy guns were used with <u>no</u> reported criminal intent in 27 of the 41 incidents examined. With one possible exception, however, a criminal threat was <u>perceived</u> by civilians who called the police or by the law enforcement officers or civilians who responded to the incident. Furthermore, since brandishing toy guns is prohibited by the laws of some states, the incident itself could sometimes be classified as a crime. In addition, in at least three cases classified as non-criminal events, the intentions of the toy gun users could not be determined from the available reports.

The circumstances surrounding the 27 non-criminal incidents are summarized below:

 In 7 incidents (4 of which involved teens and children) the persons were playing with or joking about a toy gun.

- Six additional situations involved persons (3 of whom were youngsters) who pretended to fire their toy guns either at civilians or law enforcement officers.
- In one incident, a man shot a seven year old child who he knew was pointing a toy gun.
- In 8 incidents, police received a report of a strange person, an armed person, or a dispute. Of these 8 incidents, 3 involved persons who were 16 years old.
- In 3 incidents, members of a police unit deployed at the Mexican border encountered persons carrying toy guns.
- One incident involved an adult who was loitering in a police parking lot in an apparent attempt to lure police officers to kill him. Another incident involved a woman who stepped onto her doorstep carrying a toy gun and was shot by another civilian.

Twelve deaths and 4 non-fatal injuries resulted from these 27 non-criminal incidents. As with the criminal incidents, a majority of non-criminal incidents for which age data are available involved adults (12 of 21 incidents).

Other characteristics. In 25 out of the 41 criminal and non-criminal incidents, law enforcement officers or civilians discharged firearms. All 25 shooting incidents resulted in deaths or injuries: 16 deaths and 5 injuries where police fired, and 4 deaths where 4 civilians shot. Of the 25 shooting incidents, 9 were associated with criminal events and 16 with non-criminal events.

A cross-tabulation of the time of day by whether the incident occurred inside or outside appears in Table 2. The largest number of incidents for which data are available occurred outside at night.

Shooting Incidents by Time of Day and Place Incident Occurred (n=25)

	Day	Night/Dusk	Time Unknown
Occurred Inside	2	6	0
Occurred Outside	4	9	4

Appendix D

Written Test Instructions Given to Test Subjects

INSTRUCTIONS

You will be standing on the sidewalk several feet from an alleyway in a section of Hogan's Alley. You are responding to a call from your dispatcher to investigate a reported prowler armed with a handgun. You will be provided with a revolver. Only unloaded blank or deactivated handguns will be used in this exercise.

When you arrive at the first location, come to ready gun position at the hip, with the barrel parallel to the ground, your finger on the trigger.

Yell "Ready" when you are prepared.

Someone will come out from the alleyway onto the sidewalk and point a weapon at you. If you feel your life is in danger, fire the revolver.

We realize that under normal circumstances you would seek cover and not leave yourself exposed in this manner. However, we want you to follow the scenario we have outlined above.

You will repeat this procedure <u>two more</u> times at the first location---that is, the prowler with a weapon will appear three different times from the same alleyway. At the end of the third trial, the prowler will escort you to the second location. You will repeat the same procedure five more times with a different prowler.

When you have completed the five trials at the second location, you will be advised to return to the Dogwood Inn classroom. Return the revolver at the classroom.

Please do not discuss the test at all with any of the officers who have not yet gone through the test.

Thank you very much for your participation.

You will now be escorted to the first location where you will be provided a revolver.

Appendix E

Subject Number

r |____

|1|

Test Evaluation Form

LOCATION ONE

Role Player:

DID YOU FILL IN YOUR NAME, THE DATE, AND THE TIME ON THE PREVIOUS TEST EVALUATION FORM?

TRIAL 1:	Use gun	(A)	[]	officer shot before you	[]	officer shot after you	[]	officer did not shoot
TRIAL 2:	Use gun	(B)	[]	officer shot before you]]	officer shot after you	. (]	officer did not shoot
TRIAL 3:	Use gun	(F)]]	officer shot before you	[]	officer shot after you	[]	officer did not shoot

Role Player:	
1. Please print your last name:	
2. CHECK DATE:	June
3. RECORD TIME:	: a.m. (Circle one) p.m.

				Appendix	E (con	tique	d) Subject Nu	mber	<u>T T I</u>
				Test Eva (co	aluatio ntinued	n For 1)	ш П		
				LOCA	TION T	WO			I <u></u> I
	Role DID PREV	Player: YOU FILL LOUS TES	. IN ST EV	YOUR NAP ALUATION	ie, the I form?	DATE	, AND THE TIM	e on the	
TRIAL 4:	Use gun	(A)	[]	officer before	shot you	[officer sho after you	r []	officer did not shoot
TRIAL 5:	Use gun	(F)	[]	officer before	shot you	[officer sho after you	ot []	officer did not shoot
TRIAL 6:	Use gun	(A)	[]	officer before	shot you	[officer sho after you)t []	officer did not shoot
TRIAL 7:	Use gun	(<i>E</i>)	[]	officer before	shot you	[officer sho after you	r []	officer did not shoot
TRIAL 8:	Use gun	(G)	[]	officer before	shot you	[officer sho after you)t []	officer did not shoot
Role	Player:								
I. 2.	Please pr CHECK DA1	rint you TE:	r la	st name:	June			Tabuya	•
3.	RECORD TI	[ME :				;	4.m. p.m.	(Circle	one)

Appendix F

Confidentiality Request Handed to Test Subjects

RESEARCH STUDY

ON THE VISIBILITY OF

MARKED TOY AND IMITATION GUNS

You have just participated in a Congressionally mandated study under the direction of the National Institute of Justice (NiJ).

You were provided a copy of "THE NEW FEDERAL REGULATION ON TOY GUN MARKINGS" on 5/22/89. This was to serve as the only briefing, bulletin board posting or communication you might receive from your department explaining the new law. No additional information was provided in an effort to assess how experienced Law Enforcement Officers react to the toy gun marking system with only limited background information.

inasmuch as even a prior knowledge of the subject matter can adversely influence the results of the research project, we ask that you do not discuss any aspect of this research with other members of the National Academy until Sunday, 6/11/89, as testing will be in progress through 10:00 pm, 6/10/89.

Your <u>cooperation</u> in not discussing this matter is deemed as important as the your participation in the study.

The findings will be presented to Congress and/or the Department of Commerce for <u>evaluation of the marking system and</u> their effectiveness in police combat situations.

Thank you for your time and effort.

Appendix G

Handout Given to FBI National Academy Students

A new federal regulation took effect on May 5, 1989, requiring that toy and imitation firearms be marked to reduce the risk of accidental misidentification, particularly by law enforcement officers in possible combat situations. The rules provide that all toy, imitation, or look-alike firearms manufactured or sold after May 5 must bear one of the following five identifying markings:

- a. an orange solid plug permanently affixed to the muzzle end of the barrel and recessed no more than 6 mm (approximately 1/4 inch) from the muzzle end of the barrel.
- b. an orange marking permanently affixed to the exterior surface of the barrel, covering the circumference of the barrel from the muzzle and for a depth of 6 mm.
- c. construction of the device entirely of transparent or translucent materials.
- d. coloration of the entire exterior surface of the device in bright red, bright orange, bright yellow, bright green, or bright blue, either singly or as the predominant color in combination with other colors in any pattern.
- e. coloration of the entire exterior surface of the device entirely in white in combination with one or more of the colors bright red, bright orange, bright yellow, bright green, or bright blue in any pattern.

Detailed Responses by Weapon Marking, Illumination, and Distance

Weapons Marked with Orange Plug

	•	Light=day	distance=15 feet	Standard error of percent
Number of trials Officer fired first Officer fired second Officer did not fire		45 34 11 0	100.0% 75.6% 24.4% 0.0%	6.4% 6.4% 0.0%
		Light=night	distance=15 feet	
Number of trials Officer fired first Officer fired second Officer did not fire		26 18 6 2	100.0% 69.2% 23.1% 7.7%	9.1% 8.3% 5.2%
		Light=day	distance=30 feet	•
Number of trials Officer fired first Officer fired second Officer did not fire		81 58 17 6	100.0% 71.6% 21.0% 7.4%	5.0% 4.5% 2.9%
		Light=night	distance=30 feet	
Number of trials Officer fired first Officer fired second Officer did not fire		49 29 20 0	100.0% 59.2% 40.8% 0.0%	7.0% 7.0% 0.0%



8.783

Detailed Responses by Weapon Marking, Illumination, and Distance (Continued)

Weapon Marked with Orange Band Outside Barrel

	Light=day	distance=15 feet	Standard error of percent
Number of trials Officer fired first Officer fired second Officer did not fire	16 10 3 3	100.0% 62.5% 18.8% 18.8%	12.1% 9.8% 9.8%
	light=night	distance=15 feet	
Number of trials Officer fired first Officer fired second Officer did not fire	5 1 3 1	100.0% 20.0% 60.0% 20.0%	17.9% 21.9% 17.9%
	light=day	distance=30 feet	
Number of trials Officer fired first Officer fired second Officer did not fire	19 10 2 7	100.0% 52.6% 10.5% 36.8%	11.5% 7.0% 11.1%
	light=night	distance=30 feet	
Number of trials Officer fired first Officer fired second Officer did not fire	12 9 2 1	100.0% 75.0% 16.7% 8.3%	12.5% 10.8% 8.0%

44

ż.

Detailed Responses by Weapon Marking, Illumination, and Distance (Continued)

Weapon Made of Transparent Green Plastic

	Light=day	distance=15 feet	Standard error of percent
Number of trials Officer fired first Officer fired second Officer did not fire	12 2 0 10	100.0% 16.7% 0.0% 83.3%	10.8% 0.0% 10.8%
	light=night	distance=15 feet	
Number of trials Officer fired first Officer fired second Officer did not fire	8 1 0 7	100.0% 12.5% 0.0% 87.5%	11.7% 0.0% 11.7%
	light=day	distance=30 feet	
Number of trials Officer fired first Officer fired second Officer did not fire	22 8 1 13	100.0% 36.4% 4.5% 59.1%	10.3% 4.4% 10,5%
	light=night	distance=30 feet	
Number of trials Officer fired first Officer fired second Officer did not fire	9 4 1 4	100.0% 44.4% 11.1% 44.4%	16.6% 10.5% 16.6%

ŧ

Detailed Responses by Weapon Marking, Illumination, and Distance (Continued)

Entire Surface of Weapon Marked with Purple and Orange Color

	Light=day	distance=15 feet	Standard error of percent
Number of trials Officer fired first Officer fired second Officer did not fire	13 5 2 6	100.0% 38.5% 15.4% 46.2%	13.5% 10.0% 13.8%
	light=night	distance=15 feet	
Number of trials Officer fired first Officer fired second Officer did not fire	4 2 1 1	100.0% 50.0% 25.0% 25.0%	25.0% 21.7% 21.7%
•	light=day	distance=30 feet	
Number of trials Officer fired first Officer fired second Officer did not fire	19 8 1 10	100.0% 42.1% 5.3% 52.6%	11.3% 5.1% 11.5%
	light=night	distance=30 feet	
Number of trials Officer fired first Officer fired second Officer did not fire	14 9 0 5	100.0% 64.3% 0.0% 35.7%	12.8% 0.0% 12.8%

Detailed Responses by Weapon Marking, Illumination, and Distance (Continued)

Weapon Marked with White Paint

	Light=day	distance=15 feet	of percent
Number of trials Officer fired first Officer fired second	6 1 4	100.0% 16.7% 66.7%	15.2% 19.2%
Officer did not fire	1	16.7%	15.2%
	light=night	distance=15 feet	
Number of trials Officer fired first Officer fired second	10 1 7	100.0% 10.0% 70.0%	9. 5%
Officer did not fire	2	20.0%	12.6%
	light=day	distance=30 feet	
Number of trials Officer fired first	21 9 3	100.0% 42.9%	10.8%
Officer did not fire	9	42.9%	10.8%
	light=night	distance=30 feet	
Number of trials Officer fired first	12 4	100.0% 33.3%	13.6%
Officer did not fire Officer did not fire	0 8	0.0% 66.7%	0.0% 13.6%

Detailed Responses by Weapon Marking, Illumination, and Distance (Continued)

Unmarked ("Real") Weapon

	Light=day	distance=15 feet	Standard error of percent
Number of trials Officer fired first Officer fired second Officer did not fire	70 52 16 2	100.0% 74.3% 22.9% 2.9%	5.2% 5.0% 2.0%
	light=night	distance=15 feet	
Number of trials Officer fired first Officer fired second Officer did not fire	42 34 8 0	100.0% 81.0% 19.0% 0.0%	6.1% 6.1% 0.0%
	light=day	distance=30 feet	
Number of trials Officer fired first Officer fired second Officer did not fire	108 85 19 4	100.0% 78.7% 17.6% 3.7%	3.9% 3.7% 1.8%
	light=night	distance=30 feet	
Number of trials Officer fired first Officer fired second Officer did not fire	64 48 16 0	100.0% 75.0% 25.0% 0.0%	5.4% 5.4% 0.0%

Appendix I

Univariate Analysis of Variance (ANOVA) Firing Rates by Type of Marking, Distance, and Lighting

Combined response at 15 and 30 feet BY Type of marking

Type of marking Distance Day or night

		Sum of		Mean		Signif
Source of variat	ion	Squares	DF	Square	F	of F
Main effects		4.571	5	0.914	4.082	0.002
Marking		4.042	3	1.347	6.016	0.001
Distance		0.403	1	0.403	1.799	0.182
Daynight		0.162	1	0.162	0.724	0.396
2-way interactio	ons	2.466	7	0.352	1.573	0.147
Marking Dis	stance	2.007	3	0.669	2.987	0.033
Marking Day	night	0.424	3	0.141	0.631	0.596
Distance Day	night	0.079	1	0.079	0.352	0.554
Explained	-	7.037	12	0.586	2.619	0.003
Residual		35.384	158	0.224		
Total		42.421	170	0.250		

Response at 30 feet BY Type of marking Day or night

	Sum of		Mean		Signif
Source of variation	Squares	DF	Square	F	of F
Main effects	0.561	4	0.140	0.555	0.696
Marking	0.542	3	0.181	0.715	0.545
Daynight	0.026	1	0.026	0.102	0.750
2-way interactions	0.545	3	0.182	0.719	0.543
Marking Daynight	0.545	3	0.182	0.719	0.543
Explained	1.106	7	0.158	0.625	0.734
Residual	22.741	90	0.253		
Total	23.847	97	0.246	1	

Response at 15 feet

ę

BY Type of marking

Day or Night

	Sum of		Mean		Signif
Source of variation	Squares	DF	Square	F	of F
Main effects	5.725	4	1.431	7.561	0.000
Marking	5.447	3	1.816	9.591	0.000
Daynight	0.181	1	0.181	0.958	0.331
2-way interactions	0.217	3	0.072	0.382	0.766
Marking Daynight	0.217	3	0.072	0.382	0.766
Explained	5.942	7	0.849	4.484	0.000
Residual	12.305	65	0.189		
Total	18.247	72	0.253		

Appendix J

Individual Data Collected from Each Test Subject June 6, 1989

Tìme	Subject	Response ^a by Location								Light F	Weather		
(p.m.)	ID No.	Loca	tion	One	Loc	atic	n T	NO.	Loca	stion One	Location	Two	if Raining
6:55	101	B1	81	F1	C1 A	1 A1	Fi	G1		656	265		Rain
7:15	102	A1	F1	A1	F2 D	3 C3	At	G1		656	265		Rain
7:20	103	A1	A1	F1	D2 C	2 A1	F1	G1		565	241		Rain
7:50	105	Fl	AI	F1	A1 C	1 03	F1	Gl		151	105		Rain
7:55	106	F3	B 1	FI	F2 E	2 A1	A3	G1 -		126	85		Rain
8:00	107	B3	A2	F2 -	A2 F	1 C3	D3	G1		100	65		Rain
8:05	108	A1	F1.	83	A1 A	1 F1	E1	G2		75	46		Rain
8:10	109	B3	F1	A2	D3 A	1 F1	C3	GL		49	26		Rain
8:15	110	B2	F1.	B 1	A2 F	1 61	Al	Gl		31	15		
8:17	111	F2	F2	82	E3 A	2 F2	A2	G2		24	11		
8:20	112	F1	FI	A1	F2 E	3 D3	A2	G2		13	5		
8:25	401	A2	F1	A1	F2 D	1 C1	A1	G1		11	5		Rain
8:30	402	E2	E1	Fl	C1 Å	2 AI	F1	G1		10	5		Rain
8:35	403	F2	E3	Fl	F2 B	3 A1	A1	G1		8	5		Rain
8:38	404	E2	F1	E2	A2 F	1 62	Al	G١		7	5		Rain
8:45	406	F2	Al	Fl	A2 C	3 D3	F١	G1		4	5		Rain
8:50	407	٤2	FI	A1	DI A	1 F1	CI	GI		3	5		Rain
8:55	408	A2	F1	E2	A2 A	1 F1	81	Gl		2	5		
9:08	410	F2	F2	A1	F2 B	1 D1	A2	G2		2	4		
9:17	411	F1	Fl	E3	81 A	I FI	A1	G2		2	4		
9:20	412	A2	E2	F2	A2 F	2 A1	81	G2		2	. 4		
9:25	201	A2	C3	Fl	A2 F	2 A1	E3	G1		2	4		

^aKey to responses:

Weapon type

- A = Orange plug in barrel
- B = Orange band outside barrel
- C = Transparent green
- D = Orange and purple
- E ≖ White paint
- F = Unmarked replica handgun
- G = Unmarked replica handgun

- -

bin lux

Response

- 1 = Officer fired before role player
- 2 = Officer fired after role player

3 = Officer did not shoot

9 = Officer response not recorded

Appendix J

Individual Data Collected from Each Test Subject June 7, 1989

Time	Subject	Response	by Location	Light R	Weather		
(p.m.)	ID No.	Location One	Location Two	Location One	Location Two	if Raining	
6:12	202	F1 F1 A1	FI EI DI AT GI	114	65		
6:20	203	F3 C3 F1	F1 E3 A1 A1 G1 2	114	651		
6:25	204	C3 C3 F1	B3 A2 A1 F3 G2	136	608		
6:41	205	F1 F1 C3	EL AL FL AL GI	205	472		
6:45	206	F1 A1 F1	A1 B1 D1 #1 G1	222	438		
6:49	207	C1 A1 F1	A1 F1 B1 D1 G1	239	404		
6:55	208	C3 F1 A1	D3 A1 F1 B1 G1	265	353		
7:00	209	A1 F2 C3	A1 A1 F1 E3 G1	286	310		
7:06	210	A2 F1 A1	F2 D3 B1 A2 G2	312	259		
7:10	211	A1 A2 F1	D1 B1 A2 F1 G1	330	225		
7:13	212	C1 F1 C3	A1 F2 E3 A2 G2	343	199		
7:16	601	B1 B1 F1	CI FI AL AL GI	355	174		
7:21	602	A1 A1 F1	F1 A1 D3 C3 G1	377	131		
7:24	603	81 F1 A1	F1 D3 A1 E3 G1	349	166		
7:27	604	A2 F1 A1	A1 C3 E3 F1 G1	321	200		
7:31	605	F1 B1 F1	D1 A2 A1 F2 G2	284	247		
7:34	606	F1 A1 F2	E3 F1 C3 A1 G1	256	281		
7:38	607	A1 F1 B2	A2 A1 F2 D1 G1	219	327		
7:42	608	B1 F1 B1	AI EI FI AI GI	182	374		
7:46	609	A1 A1 F2	F1 A1 B3 C3 G2	145	420		
8:09	610	F1 03 F1	83 A1 A2 F1 G1	514	276		
8:12	511	D2 F1 D3	A1 E2 F1 A1 G2	480	259		
8:15	612	F1 A1 F1	E1 F1 C3 A1 G1	447	241		
9:00	613	DI FI AL	FI BI AL EL GI	3	5		
9:04	614	A3 F1 D3	A2 A2 F1 B2 G1	3	5		
						•	
9:07	615	D2 D1 F1	C2 F1 A1 A2 G1	3	5		
9:10	616	A2 F1 A2	A2 C3 E3 F1 G1	3	5		
9:13	617	AI AI FI	FI AT DI BI GI	3	5		
9:16	618	F1 C3 F1	D3 A2 A1 F1 G1	3	5		
9:19	619	F1 A1 F1	EI FI BI AI GI	3	5		
		··· ··			-		
9:22	620	C3 F1 C9	A1 E1 F1 A1 G1	· · · · 3	. 5		
9:26	621	C3 F1 A1	F1 D3 A1 E3 G1	3	5		
9:30	622	A3 F1 A1	A2 B1 E3 F2 G1	3	5		
,					-		

⁸Key to responses:

Weapon	type

A = Orange plug in barrel

C = Transparent green

D = Orange and purple

E = White paint

B = Orange band outside barrel

F = Unmarked replica handgun
G = Unmarked replica handgun

Response

- 1 = Officer fired before role player
- 2 = Officer fired after role player
- 3 = Officer did not shoot
- 9 = Officer response not recorded

bin lux

Appendix J

Time	Subject	Response ^a by Location								Light	Weather			
(p.m.)	ID No.	Loca	stion	One	Lo	cat	ion	Two	Lo	cation One	Loca	tion Two	<u>if</u> R	aining
5:59	301	Al	Ă1	F1	81	CI	A1 F	1 G1		296		450		
6:07	302	F2	A1	FI	A2	C3	82 I	1 G1		296		450		
6:12	303	F2	D3	F1	F3	E1	A3 /	41 G1		296		450		
6:50	304	D3	Fl	A1	83	A1	F1 (3 G1		217	:	647		
6:55	305	D3	A1	F2	A3	F2	C3 8	33 G1		206		675		
7:00	306	FI	F1	A1	Fl	E1	B1 /	A1 G1		195		703		
7:01	307	A2	F1	DI	A1	A1 .	F1 8	E3 G1		192		709		
7:06	308	D2	F1	D1	Al	F1.	E1 #	1 G1		181		737		
7:12	309	A2	D1	F2	A2	F2	A1 E	2 G1		366		350		
7:15	310	A1	FI	A1	F1	81	C1 /	VI G1		458		157		
7:18	311	DI	Ď1	F1	CI	AT	A1 F	1 G1		439		214		
7:24	312	F2	F1	D3	E3	AT I	F1.A	2 G1		401		327		
7:25	626	E2	E2	F1	CI	F1 .	A1 A	1 G1		388		365		
7:27	623	C3	C3	Fl	B3	F1 .	A3 /	2 G1		382		384		
7:30	624	A2	F1	C3	A1	Å1	F1 ()3 G1		363		440		
7:33	625	El	Fl	Al	F١	D1 /	A1 8	1 G1		344		497		
8:08	627	E2	F2	E2	A3	<u>8</u> 3	F3 A	\3 G3		320		550		
8:12	628	A2	F2	A2	Al	C1	81 F	1 G1		351		451		
8:14	629	A1	A1	F1 ·	F١	A1	ס וס	3 G1		367		402		
8:17	630	F2	A1 -	F2	B2	F1 (C3 /	1 G1		391		328		
8:49	631	A2	F2	E3	A2	A2	F2 ()3 G2		96		55		
9:13	632	F2	E2 .	F2	D1	A2 /	A2 F	1 G1		3		4		
9:17	501	82	F1 .	61	C3	F1 /	A1 /	1 G1		2		4		
9:21	502	B2	83	F1	F2	A2	A2 E	3 G2		2		4		
9:23	503	F1	A1.	F1	F1	E1 (C3 A	1 G1		2		3		
9:27	504	F2	82	F1	A1	F2	E3 A	1 G1		2		3		
9:30	505	A1	A1	F1	A1	C1	D3 F	1 G1		2		3		
9:33	506	A1	F1	AL	DI	A2 1	F1 C)1 G1		2		3		
9:35	507	C3	C3	Fl	F2	A2 /	A1 E	3 G2		2		3		
9:38	508	CI	Fl	C3	81	Fi	A1 A	1 G1		2		3		
9:43	3 09	A1	F1	A1	D1	At I	F1 [01 G1		2		2		

Individual Data Collected from Each Test Subject June 8, 1989

^aKey to responses:

Weapon type

- A = Orange plug in barrel
- B = Orange band outside barrel
- C = Transparent green
- D = Orange and purple
- E = White paint
- F = Unmarked replica handgun
- G = Unmarked replica handgun

Response

1 = Officer fired before role player

- 2 = Officer fired after role player
- 3 = Officer did not shoot
- 9 = Officer response not recorded

b_{in lux}