

NBSIR 74-623

Stability and Abuse Tests of Riding Toys

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Product Systems Section
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U. S. DEPARTMENT OF COMMERCE, Frederick B. Dent, Secretary
NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, Director

Introduction

Each year hundreds of children are injured as a result of falling from poorly balanced riding toys or being victimized by toys which have structural design deficiencies. In attempting to deal with this problem, a test program was implemented by the Product Engineering Division, National Bureau of Standards, under the sponsorship of the Consumer Product Safety Commission. This program was designed to provide information which can be utilized to set realistic abuse performance levels for riding toys, as well as characterize the types of stability hazards associated with these toys.

Stability and abuse tests were conducted on ride-on or ride-in toys, other than tricycles and scooters, designed for use by children 8 years old or less. These tests were conducted on 88 toys which were designed to be used in a ride-on or ride-in mode. To facilitate control while testing and evaluating the test results, the test specimens were divided into the following groups:

- Group I - Ride-on toys (RO)
- Group II - Ride-in toys (RI)
- Group III - Wagons (W)

Photographs of all specimens tested can be found in appendix A of this report.

The toys used for testing were selected at random and purchased on the open market at various retail toy outlets. Some of the toys had an age usage specification already assigned to them at the time of purchase. Others had no age usage specification assigned. Those toys not having an age usage specification were classified on the basis of size and construction similarities to toys already classified for usage according to age.

All stability tests were conducted with an appropriate test weight, representing the 95th percentile weight 1/ of children found in the oldest group of anticipated users, mounted on the test specimen. These test weights were assigned to each test specimen on the basis of the age usage classification of the specimen. The age and weight classifications of individual toy specimens are presented in table 1. The various combinations of age and weight designations used when testing the stability of riding toys are as follows:

1/ The 95th percentile weights of children 3 to 6 years old were extrapolated from data presented in reference 1. The 95th percentile weights of children 6 through 8 were obtained from data presented in reference 2.

<u>Age</u> (years)	<u>95th Percentile Weight</u>	
	(kilograms)	(pounds)
3	18.1	40
4	22.7	50
5	25.0	55
6	27.2	60
7	29.5	65
8	34.0	75

All toys rated for use by children 4 years old and above were tested at 18.1 kg (95th percentile weight of a 3 year old child) prior to being tested with their assigned test weights.

A description of some of the pertinent parameters characterizing each toy specimen is presented in tables 2 through 4a of this report.

Test Description

Static Stability Tests

Forward, backward, and sideways static stability tests were conducted on 84 riding toys designed for use by children 8 years old or less. These tests were conducted in order to provide stability data which can be used in the development of standards intended to eliminate or minimize unexpected hazards that could occur when toys are constructed in a manner that will cause them to easily tip over.

The first step of the static stability tests consisted of loading the toys with the 95th percentile weight of children in the oldest age bracket for which the toy is designed. The test weight was affixed to the toy by clamping, tying, taping, or otherwise mounting the weight to the seat or anticipated seating area of the test specimen.

After installing the test weight on the item to be tested, the test specimen was placed on a 5 cm (2 in) thick, 0.9 m (3 ft) by 1.5 m (5 ft) concrete slab. The surface finish of the concrete was representative of the concrete surfaces found on residential sidewalks and driveways. One end of the concrete slab was then slowly raised with the test specimen successively in a forward, backward, or sideways orientation. If the test specimen lost stability by tipping over, the angle at which loss of stability occurred was recorded.

Three trials were allowed for each specimen in each of the test orientations. The wheels of the test specimen were chocked, when necessary, to prevent the specimen from rolling or sliding. The maximum tilt angle to which any test specimen was subjected was 35° from the horizontal.

Two different test weights were used when conducting the toy stability tests. One of the test weights, constructed during the initial phase of the test program, had a total weight of 18.1 kg (40 lb) and was used to simulate the 95th percentile weight of a 3 year old child. This weight had a center of gravity 19.8 cm above the bottom of its baseplate and consisted of a cylindrical metal mass mounted around a vertical shaft. The bottom of the shaft screwed into a 7.6 cm (3 in) by 12.7 cm (5 in) by 2.5 cm (1 in) metal baseplate. The second test weight consisted of a vertical cylindrical metal mass, screwed into a metal baseplate, with a smaller metal rod passing horizontally through the cylinder 21.34 cm above the bottom of the baseplate. Smaller weights were mounted on each arm of the horizontal rod to achieve the weights desired to simulate the 95th percentile weight of children in various age groups.

Both test weights were constructed so that either of two interchangeable metal baseplates could be used for attaching the test weight to the test specimen. One baseplate rested on a 25 mm (1 in) thick layer of low density polyurethane foam so that it would more readily conform to the curved seating areas of some of the test specimens. The other baseplate rested on eight one-inch (25 mm) wide suction cups for better adherence to flat seating surfaces.

When designing the test weights used to simulate the 95th percentile weights of children 3 through 8 years old, a prime consideration was the location of the centers of gravity of the weights with respect to the seating surface of the test specimens. A review of child anthropometric data indicated that the centers of gravity of children 3 to 8 years old, when seated, range from 19.8 cm (7.8 in) to 21.3 cm (8.4 in) ^{2/} above the bottom of the buttocks in the vertical plane. Consequently, the test weights used to simulate the 95th percentile weights of children in various age groups were constructed with centers of gravity 19.8 cm (7.8 in) and 21.3 cm (8.4 in) above the bottom of the mounting fixtures.

Dynamic Stability Test

Dynamic stability tests were conducted on ride-on and ride-in toys at velocities of 1.2 and 1.8 m/s (4 and 6 ft/s). These tests consisted of loading the toy with a test weight, simulating the 95th percentile weight of the oldest anticipated user of the toy, and allowing each toy to impact rectangular shaped obstructions 0.6, 1.3, and 2.5 cm (0.25, 0.50 and 1.0 in) high. These obstructions were intended to simulate door sills, carpet

^{2/} The 3 year old center of gravity value was extrapolated from data presented in reference 3. Center of gravity values for children 5 through 8 were taken directly from the data presented in reference 3.

molding, rocks or other raised obstructions likely to be encountered in a normal use environment. The toys were tested in both a forward and backward orientation when possible.

In conducting the dynamic stability tests, the toy was placed on a plywood ramp, with an elevation necessary to generate the required test speeds, and held in place by the test conductor. The wheels were aligned in the direction of intended motion and the obstruction was placed in the path of intended motion so that either one or both of the lead wheels of the test specimen would impact the obstruction. The obstruction was placed far enough from the end of the ramp so that the test specimen was moving on a flat surface prior to impact. As a result of impact, the test specimen would either stop, roll over the obstruction, or tip over. At least two trials were conducted for each combination of test parameters.

The velocity of each test specimen, when leaving the test ramp, was computed by utilizing a measurement system composed of two phototransistors, two light sources, a dc power supply, and a timer. The phototransistors were mounted 15.2 cm (6.0 in) apart at the edge of the ramp and immediately in front of the obstruction to be impacted. Two light sources, placed directly in front of the phototransistors on the opposite side of the ramp, generated beams which were interrupted each time a toy rolled off the ramp, causing voltage pulses to be emitted by the phototransistor circuits which initiated and stopped a timer. The velocity of the specimen was then calculated based on the time required for the specimen to travel 15.2 cm.

Toy Abuse Test

Each toy was placed at the top of a stairway in a forward, backward or sideways orientation, and allowed to tumble down the stairway onto a vinyl asbestos floor surface. A total of three trials were conducted per toy, when possible, and a thorough inspection was conducted on each test specimen after each trial. Any structural or mechanical defect resulting from the fall was recorded and evaluated for its hazard-producing potential.

The stairway used for testing was constructed of hardwood and varnished to simulate stairways normally found in the home. This stairway consisted of 14 steps, with risers 2.76 cm (7.0 in) high, with a hinged landing at its top. This landing was slowly raised until enough impetus was provided to start the toy down the stairway.

Test Results

Static Stability Tests

The results of the static stability tests are presented, in detail, in table B-1 through B-4 in appendix B of this report. These data are summarized in tabular form as frequency distributions in tables 5 through 8. The summary test data are based on the performance of the test specimens when tested with their assigned test weight only, even though some data at other test weights were obtained.

When comparing the results of the static stability tests to the tilt angle parameters specified in paragraph 4.15 of the Proposed Voluntary Product Standard TS 215, Safety Standard for Toys 4/, several interesting observations can be made. Of the ride-on toys tested, 9% of the toys tested in a backward orientation and 38% of those tested in a sideways orientation tipped over at tilt angles less than 10°. No ride-on toys tipped over in a forward orientation at tilt angles less than 10°. Approximately 44% of the ride-in toys tested in a backward orientation, as well as 27% of the wagons, tipped over at tilt angles less than 15°. None of these toys tipped over at an angle less than 15° in the forward and sideways orientations.

Table 8 contains a composite frequency distribution for all riding toys tested for static stability, regardless of whether the test specimen was a ride-on or ride-in toy. It is interesting to note that only 1.3% of all toys tested in a forward orientation tipped over at a tilt angle less than 15° (none tipped over at a tilt angle less than 10°). When tested in a backward orientation, 10% of all test specimens tipped over at a tilt angle less than 10° and 35% of the test specimens tipped over at a tilt angle less than 15°. Approximately 26% of all toys tested in a sideways orientation tipped over at angles less than 10° and approximately 54% of these toys tipped over at angles less than 15°.

Based on these results, it is apparent that riding toys, as a class, are most likely to tip over in a sideways orientation and least likely to tip over in a forward orientation. More specifically, it can be construed from the test data that ride-in toys tend to tip over most readily in a backward orientation and ride-on toys tend to tip over most readily in a sideways orientation.

Several structural and mechanical failures occurred during the static stability tests. These failures can generally be characterized as collapsing seats or other portions of the test specimens due to the test weight (see figures 1 through 4) and specimen instability due to design and construction deficiencies. A summary of all failures encountered during the static stability tests is presented in table 9.

4/ The proposed tilt angle limitations in this proposed standard are 10° when the rider's feet are available for stabilization and 15° when the rider's feet are unavailable for stabilization.

Dynamic Stability Test

A summary of the results of the dynamic stability test is presented in tables 10 and 11. Table 10 contains information on the number of toys which initially tipped over at a given obstruction height while traveling at speeds of 1.2 or 1.8 m/s. Table 11 contains cumulative totals of the number of specimens which tipped over at various obstruction heights during test.

An examination of the dynamic stability test data reveals that for both ride-on and ride-in toys, the percentage of specimens which tipped over in a backward orientation at given obstruction levels greatly exceeded the number of specimens which tipped over in a forward orientation at respective obstruction levels. These data also indicate that for the range of obstruction heights used in this test, the probability of a toy tipping over, in general, increases as the height of the obstruction impacted increases and the velocity at which the toy is traveling increases.

Mechanical failures occurring during the dynamic stability test are described in table 12 of this report. In general, these failures involved cracked, broken or dislodged parts (see figure 5), flattened wheels, and structural collapse of test specimens.

A tabulation of the raw data acquired during the dynamic stability test is presented in tables B-5 through B-10 of appendix B.

Toy Abuse Test

Several failures occurred during the toy abuse test (stairway drop test). These failures are described in table 13. In general, the abuse test failures can be characterized as cracked, bent, or broken parts, and dislodged Pal nuts (cap nuts), which are normally used to anchor wheels or other objects in place.

Figures 6 through 19 illustrate some of the failures incurred during the toy abuse test. Figure 20 shows an assortment of Pal nuts which were used in the construction of various riding toys, some of which were dislodged during the stability and abuse tests. It is obvious that a serious hazardous condition could result if, for example, a Pal nut anchoring a wheel or steering mechanism on a toy, became dislodged while the toy was being used.

Recommendations

1. It is recommended that all riding toys be labeled according to maximum weight, in addition to age, because great variations exist in the weights of children within the same age group.

2. Due to the many instances of structural collapse encountered when loading a toy with the 95th percentile weight of children who would normally use the toy, it is recommended that some consideration be given to possible methods of increasing the strength of hollow-bodied plastic toys. This could possibly be done by the following methods:
 - (a) Increasing the thickness of the material used in the construction of the toy.
 - (b) Increasing the amount of internal support within the hollow portion of a toy's body to minimize structural collapse.
 - (c) Using plastic materials which have strength characteristics that will allow the toy to adequately support the weight of its user.
3. Several instances of Pal nut (cap nut) dislodgment due to impact were encountered during both the stability and abuse tests. Because of the repeated occurrence of this type of failure, it is recommended that some effort be made to develop a performance requirement that will prevent this type of situation from occurring.

Summary

Static and dynamic stability tests were conducted on 88 riding toys by members of the Product Engineering Division, NBS, in order to characterize the types of stability hazards associated with this class of toys. In addition, abuse tests were conducted on the same test specimens to provide information which can be utilized to set realistic abuse performance levels for riding toys.

The data obtained from these tests can be used in formulating criteria for establishing test methods and performance standards for riding toys. These data can also be of value in identifying potential hazards associated with riding toys.

References

1. Malina, R. M., Hamill, P.V.V. and Lemeshow, S.; "Selected Body Measurements of Children 6-11 Years," United States Department of Health, Education, and Welfare, Vital and Health Statistics, Series II, No. 123, 1973.
2. Krogman, W.M., "Growth of Head, Face, Trunk, and Limbs in Philadelphia White and Negro Children of Elementary and High School Age," Monographs of the Society for Research and Child Development, 35:136, 1970.
3. Swearingen, J. J. and Young, J.W., "Determination of Centers of Gravity of Children Sitting and Standing," Federal Aviation Agency, AM65-23, 1965.
4. "Safety Standards for Toys," Proposed Voluntary Product Standard TS215, Office of Engineering Standards Services, NBS, June 1973.

Table 1. Age and Weight Classifications for Ride-On Toys (RO), Ride-In Toys (RI), and Wagons (W)

<u>Specimen Number</u>	<u>Mfr. Age Designation</u> years	<u>Maximum Weight</u> <u>Used for Testing</u>	
		lb	kg
RO-1	1 - 3	40	18.1
RO-2 <u>a/</u>	1 - 4	40	18.1
RO-3	1 1/2 - 3	40	18.1
RO-4	1 - 4	50	22.7
RO-5 <u>b/</u>	1 1/2 - 4	-	-
RO-6	1 - 4	50	22.7
RO-7	1 1/2 - 5	55	25.0
RO-8	1 1/2 - 3 1/2	40	18.1
RO-9	1 - 4	50	22.7
RO-10	1 - 4	50	22.7
RO-11	1 - 4	50	22.7
RO-12 <u>c/</u>	1 - 3	60	27.2
RO-13 <u>d/</u>	-	40	18.1
RO-14	1 - 3	40	18.1
RO-15	1 - 4	50	22.7
RO-16 <u>d/</u>	-	40	18.1
RO-17	2 - 5	55	22.7
RO-18 <u>c/</u>	3 - 7	60	27.2
RO-19	1 - 3	40	18.1
RO-20 <u>d/</u>	-	40	18.1
RO-21 <u>d/</u>	-	40	18.1
RO-22 <u>d/</u>	-	40	18.1
RO-23 <u>d/</u>	-	40	18.1
RO-24 <u>d/</u>	-	40	18.1
RO-25 <u>d/</u>	-	40	18.1
RO-26 <u>d/</u>	-	40	18.1
RO-27 <u>d/</u>	-	40	18.1

Table 1. Continued

<u>Specimen Number</u>	<u>Mfr. Age Designation</u> years	<u>Maximum Weight</u> <u>Used for Testing</u>	
		lb	kg
RO-28 <u>d/</u>	-	40	18.1
RO-29 <u>d/</u>	-	40	18.1
RO-30 <u>d/</u>	-	40	18.1
RO-31 <u>d/</u>	-	40	18.1
RO-32 <u>d/</u>	-	40	18.1
RO-33 <u>d/</u>	-	40	18.1
RO-34 <u>d/</u>	-	40	18.1
RO-35 <u>d/</u>	-	40	18.1
RO-36 <u>d/</u>	-	40	18.1
RO-37 <u>b/</u>	-	-	-
RO-38 <u>b/</u>	-	-	-
RO-39	2 - 5	55	25.0
RO-40 <u>d/</u>	-	60	27.2
RO-41 <u>d/</u>	-	40	18.1
RO-42 <u>d/</u>	-	40	18.1
RO-43	2 - 6	60	27.2
RO-44	2 - 6	60	27.2
RO-45	2 1/2 - 5	55	25.0
RO-46	2 - 4	50	22.7
RO-47 <u>d/</u>	-	60	27.2
RO-48	1 1/2 - 3	40	18.1
RO-49	3/4 - 2	40	18.1
RO-50	1+	40	18.1
RO-51 <u>d/</u>	-	40	18.1
RO-52	3 - 6	60	27.2
RO-53	2 - 6	60	27.2
RO-54	3 - 10	75	34.0
RO-55 <u>d/</u>	-	60	27.2
RO-56	4 - 8	75	34.0
RO-57 <u>d/</u>	-	75	34.0

Table 1. Continued

<u>Specimen Number</u>	<u>Mfr. Age Designation</u> years	<u>Maximum Weight</u> <u>Used for Testing</u>	
		lb	kg
RO-58 <u>d/</u>	-	75	34.0
RO-59 <u>d/</u>	-	75	34.0
RI-1	1/2 - 3	40	18.1
RI-2	1/2 - 2 1/2	40	18.1
RI-3	3 - 6	60	27.2
RI-4	2 - 4	50	22.7
RI-5 <u>d/</u>	-	50	22.7
RI-6 <u>d/</u>	-	60	27.2
RI-7 <u>d/</u>	-	60	27.2
RI-8 <u>d/</u>	-	75	34.0
RI-9 <u>d/</u>	-	60	27.2
RI-10 <u>d/</u>	-	60	27.2
RI-11 <u>d/</u>	-	50	22.7
RI-12 <u>d/</u>	-	75	34.0
RI-13 <u>d/</u>	-	75	34.0
RI-14	3 - 7	65	29.5
RI-15 <u>d/</u>	-	75	34.0
W-1	1 - 4	50	22.7
W-2	2 - 5	55	25.0
W-3	2 - 6	60	27.2
W-4	4 - 8	75	34.0
W-5	1 - 4	50	22.7
W-6 <u>d/</u>	-	60	27.2
W-7 <u>d/</u>	-	75	34.0
W-8 <u>d/</u>	-	40	18.1
W-9 <u>d/</u>	-	40	18.1
W-10 <u>d/</u>	-	75	34.0
W-11	1 - 4	50	22.7
W-12	5+	75	34.0
W-13	5+	75	34.0
W-14	5+	75	34.0

Table 1. Continued

NOTE: All toys were tested at forty pounds before tests at heavier weight were performed.

- a/ Toy was broken before heavier weight tests could be performed.
- b/ Toy design prevents weight from being mounted.
- c/ Toy was rated by manufacturer to a higher or lower load than age designation signified.
- d/ Weight was assigned based on similarity of this toy to a toy with an age range designated by its manufacturer.

Table 2. Measurements of Body Dimensions of Ride-On Toys

Specimen Number	Weight		Height		Length		Width		Seat Width		Seat Height	
	lb	kg	in	cm	in	cm	in	cm	in	cm	in	cm
RO-1	3.3	1.5	15	38.1	20 1/2	52.1	13	33.0	7	17.8	11	27.9
RO-2	4.6	2.1	14 1/4	36.2	22	55.9	10	25.4	7 3/4	19.7	9 1/2	24.1
RO-3	5.3	2.4	14 1/4	36.2	21	53.3	9	22.9	9	22.9	9 3/4	24.8
RO-4	4.7	2.1	16 1/2	41.9	19	48.3	14	35.6	7 1/2	19.0	9 1/2	24.1
RO-5	4.6	2.1	15	38.1	19	48.3	14 3/4	37.5	4 3/4	12.1	10 3/4	27.3
RO-6	4.7	2.1	16	40.6	19 1/2	49.5	11	27.9	6 1/2	16.5	7 1/2	19.0
RO-7	8.1	3.7	14 3/4	37.5	24	61.0	22	55.9	4 1/2	11.4	8	20.3
RO-8	3.5	1.6	14 7/8	37.8	18 1/4	46.4	17	43.2	3 7/16	8.7	7 1/2	19.0
RO-9	3.1	1.4	14	35.6	17 3/4	45.1	16 3/4	42.5	6	15.2	8	20.3
RO-10	4.1	1.8	14 1/8	35.9	17 1/2	44.4	12	30.5	7 1/2	19.0	8 1/2	21.6
RO-11	5.3	2.4	14 1/2	36.8	18	45.7	10	25.4	8	20.3	9	22.9
RO-12	5.5	2.5	14 1/2	36.8	26 3/4	67.9	17 1/2	44.4	5 1/2	14.0	8 1/2	21.6
RO-13	3.9	1.8	10 1/2	26.7	25	63.5	13	33.0	8	20.3	7 1/2	19.0
RO-14	3.8	1.7	15 1/2	39.4	16 1/2	41.9	14	35.6	6	15.2	9	22.9
RO-15	4.2	1.9	16 1/8	41.0	20 1/2	52.1	11 3/4	29.8	5	12.7	8	20.3
RO-16	8.6	3.9	23 1/2	59.7	26	66.0	12 1/2	31.8	6	15.2	16	40.6
RO-17	6.2	2.8	30 1/2	77.5	25	63.5	10	25.4	7	17.8	11 1/8	28.3
RO-18	9.8	4.4	20 3/4	52.7	34	86.4	18 1/2	47.0	5 1/2	14.0	10	25.4
RO-19	3.3	1.5	18 1/4	46.4	17 1/2	44.4	9 1/2	24.1	5 1/4	13.3	7 7/8	20.0
RO-20	3.4	1.5	14 1/4	36.2	19	48.3	10	25.4	5	12.7	9 3/4	24.8
RO-21	4.3	2.0	13	33.0	18	45.7	12 1/2	31.8	10	25.4	9 3/4	24.8
RO-22	4.0	1.8	13	33.0	26	66.0	13	33.0	7	17.8	8 7/8	22.5
RO-23	3.3	1.5	13 1/4	33.7	24	61.0	8 1/2	21.6	8	20.3	8 1/2	21.6

Table 2. Continued

Specimen Number	Weight		Height		Length		Width		Seat Width		Seat Height	
	lb	kg	in	cm	in	cm	in	cm	in	cm	in	cm
R0-24	3.9	1.8	13 3/4	34.9	22 1/2	57.2	10 1/2	26.7	9 1/2	24.1	9	22.9
R0-25	1.9	0.8	11 1/4	28.6	20 1/2	52.1	7 1/2	19.0	6 5/8	16.8	9 1/2	24.1
R0-26	2.9	1.3	14 5/8	37.2	20	50.8	9	22.9	6	15.2	10 1/4	26.0
R0-27	2.7	1.2	18 7/8	47.9	17 3/8	44.1	8 1/4	21.0	5	12.7	10 1/4	26.0
R0-28	3.8	1.7	16 3/4	42.5	20 3/8	51.8	9 3/4	24.8	7 3/4	19.7	8	20.3
R0-29	3.2	1.4	11 3/4	29.8	23	58.4	17 3/4	45.1	5	12.7	9 1/4	23.5
R0-30	4.4	2.0	11 1/4	28.6	25 1/2	64.8	21 3/4	55.2	6 1/2	16.5	8 1/2	21.6
R0-31	2.6	1.2	18 1/2	47.0	26	66.0	7	17.8	6	15.2	10 1/2	26.7
R0-32	1.5	0.7	13 1/2	34.3	15 1/2	39.4	7	17.8	6	15.2	8 3/4	22.2
R0-33	3.0	1.3	18 1/2	47.0	18 1/2	47.0	10	25.4	7 3/4	19.7	8 1/2	21.6
R0-34	2.7	1.2	14 3/4	37.5	18	45.7	7 3/4	19.7	7 1/2	19.0	10 1/2	26.7
R0-35	3.9	1.8	12 1/2	31.8	25 3/4	65.4	10	25.4	9	22.9	9	22.9
R0-36	3.5	1.6	11 1/4	25.6	20 1/2	52.1	12 1/2	31.8	9	22.9	8 1/2	21.6
R0-37	4.4	2.0	14	35.6	23	58.4	10	25.4	10	25.4	13	33.0
R0-38	4.5	2.0	12 1/4	31.1	23 3/4	60.3	10	25.4	8	20.3	9 1/2	24.1
R0-39	5.0	2.3	17 1/2	44.4	34	86.4	14	35.6	8	20.3	6 5/8	16.8
RC-40	7.7	3.5	20 1/4	51.4	22 1/2	57.2	20 3/4	52.7	4	10.2	12 1/2	31.8
R0-41	5.0	2.3	24 1/2	62.2	26 1/2	67.3	11	27.9	6 1/2	16.5	14	35.6
R0-42	4.1	1.9	17 1/2	44.4	18	45.7	17 1/4	43.8	4	10.2	8	20.3
R0-43	7.1	3.2	17	43.2	24	61.0	15 1/2	39.4	6	15.2	10 1/2	26.7
R0-44	7.6	3.4	18 1/2	47.0	35	88.9	14 1/2	36.8	4 1/2	11.4	15	38.1
R0-45	8.1	3.7	23 1/2	59.7	24	61.0	15 1/2	39.4	7	17.8	14 1/2	36.8

Table 2. Continued

Specimen Number	Weight		Height		Length		Width		Seat Width		Seat Height	
	lb	kg	in	cm	in	cm	in	cm	in	cm	in	cm
RO-46	6.6	3.0	20	50.8	25 1/2	64.8	13	33.0	3 1/2	8.9	11 1/2	29.2
RO-47	15.5	7.0	23	58.4	31 1/2	80.0	18 1/2	47.0	8	20.3	10 1/2	26.7
RO-48	4.0	1.8	12 1/2	31.8	15 1/2	39.4	8 1/2	21.6	6 1/2	16.5	6	15.2
RO-49	4.1	1.9	15	38.1	19	48.3	16	40.6	5	12.7	9	22.9
RO-50	3.1	1.4	13 1/2	34.3	16 3/4	42.5	10 1/2	26.7	3	7.6	7 1/2	19.0
RO-51	2.5	1.1	14	35.6	24 1/2	62.2	9	22.9	9	22.9	8 1/2	21.6
RO-52	17.4	7.9	31 1/2	80.0	28	71.1	16	40.6	5 1/2	14.0	19	48.3
RO-53	9.6	4.3	17 1/2	44.4	29 1/2	74.9	14 1/2	36.8	5 1/2	14.0	15	38.1
RO-54	22.0	10.0	30 1/2	77.5	62	157.5	24 1/2	62.2	10	25.4	12	30.5
RO-55	22.0	10.0	24 1/4	61.6	46	116.8	21 1/2	54.6	8 1/2	21.6	10	25.4
RO-56	28.5	12.9	23 1/2	59.7	35 1/2	90.2	21 1/2	54.6	8 1/2	21.6	12	30.5
RO-57	18.8	8.5	24 1/4	61.6	33 1/2	85.1	21 1/4	54.0	7 1/2	19.0	13 1/2	34.3
RO-58	13.0	5.9	29 1/4	74.3	43 1/2	110.5	17	43.2	4 1/2	11.4	14 1/2	36.8
RO-59	32.8	14.9	27 3/4	70.5	36 1/2	92.7	19 1/4	48.9	8 1/2	21.6	15	38.1

Table 2a. Measurements of Wheels and Wheel Base of Ride-On Toys

Specimen Number	Distance Between Wheels		Wheel Base		Thickness of Wheels		Diameter of Wheels							
	Front	Back	in	cm	Front	Back	Front	Back						
	in	cm	in	cm	in	cm	in	cm						
RO-1	6 1/8	15.6	5 7/8	14.9	12	30.5	1 1/2	3.8	1 1/2	3.8	3 1/2	8.9	3 1/2	8.9
RO-2	3	7.6	3	7.6	12	30.5	3 1/2	8.9	3 1/2	8.9	3 3/4	9.5	3 3/4	9.5
RO-3	5 3/4	14.6	5 3/4	14.6	8 1/4	21.0	1 1/2	3.8	1 1/2	3.8	3 1/4	8.5	3 1/4	8.5
RO-4	3	7.6	6 1/2	16.5	13 3/4	34.9	1 1/4	3.2	1 1/4	3.2	5	12.7	5	12.7
RO-5	-	-	-	-	13 1/4	33.7	6	15.2	6	15.2	5	12.7	5	12.7
RO-6	7 1/2	19.0	7 3/8	18.7	13 1/2	34.3	1 3/4	4.4	1 3/4	4.4	4 1/2	11.4	4 1/2	11.4
RO-7	11	27.9	-	-	16	40.6	2	5.1	1 1/2	3.8	3 3/4	9.5	3	7.6
RO-8	5	12.7	6 3/8	16.2	13 1/4	33.7	1 1/4	3.2	1 1/4	3.2	5	12.7	5	12.7
RO-9	4 3/4	12.1	6	15.2	12 3/4	32.4	1 1/2	3.8	1 1/2	3.8	5	12.7	5	12.7
RO-10	2 7/8	7.3	8 1/2	21.6	13 1/4	33.7	1 1/4	3.2	1 1/4	3.2	5	12.7	5	12.7
RO-11	2 3/4	7.0	6 1/2	16.5	13 1/4	33.7	1 1/4	3.2	1 1/4	3.2	5	12.7	5	12.7
RO-12	-	-	3 1/2	8.9	20 1/2	51.4	4 1/2	11.4	7 1/2	19.0	7	17.8	7 1/2	19.0
RO-13	6 1/2	16.5	6 1/2	16.5	16 5/8	42.2	3/4	1.9	3/4	1.9	4 1/4	10.8	4 1/4	10.8
RO-14	6 3/4	17.1	6 5/8	16.8	10 1/4	26.0	1 1/4	3.2	1 1/4	3.2	5	12.7	5	12.7
RO-15	4 3/4	12.1	6	15.2	14 1/4	36.2	2 5/4	7.0	2 3/4	7.0	5 3/4	14.6	5 3/4	14.6
RO-16	7 1/8	18.1	7	17.8	19 3/4	50.2	2 3/4	7.0	2 3/4	7.0	6	15.2	6	15.2
RO-17	7	17.8	7	17.8	17	43.2	1 1/2	3.8	1 1/2	3.8	5	12.7	5	12.7
RO-18	-	-	14 3/8	36.5	18 3/4	47.6	1 1/4	3.2	2	5.1	6 1/2	16.5	5	12.7
RO-19	6 5/8	16.8	6 5/8	16.8	14	35.6	1 1/4	3.2	1 1/4	3.2	3 3/4	9.5	3 3/4	9.5
RO-20	4	10.2	4	10.2	9 3/4	24.8	2 1/2	6.4	3	7.6	3 7/8	9.8	4 1/2	11.4
RO-21	7 1/2	19.0	7 1/2	19.0	11 1/4	28.6	2 1/2	6.4	2 1/2	6.4	5	12.7	5	12.7
RO-22	10 1/4	26.0	8 7/8	22.5	15 1/2	39.4	1 1/2	3.8	2	5.1	4 7/8	12.4	5 3/4	14.6
RO-23 a/	1 7/8	4.8	1 7/8	4.8	13 1/4	33.7	3/4	1.9	3/4	1.9	1 1/2	3.8	1 1/2	3.8

Table 2a. Continued

Specimen Number	Distance Between Wheels		Wheel Base		Thickness of Wheels		Diameter of Wheels						
	Front in	Back cm	in	cm	Front in	Back cm	Front in	Back cm					
RO-24	7 7/8	20.0	6 5/8	16.8	14 1/2	36.8	1 1/4	3.2	2	5.1	12.7	6	15.2
RO-25	4 7/8	12.4	6 1/4	15.9	12	30.5	3/4	1.9	3/4	1.9	4 7/8	4 7/8	12.4
RO-26	7 1/4	18.4	7 1/4	18.4	14 1/4	36.2	7/8	2.2	7/8	2.2	4 1/4	4 1/4	10.8
RO-27	4 3/4	12.1	4 7/8	12.4	13	35.0	1	2.5	1	2.5	4 3/8	4 3/8	11.1
RO-28	5 3/4	14.6	5 3/4	14.6	12 1/2	31.8	2	5.1	2	5.1	5 1/2	5 1/2	14.0
RO-29	5 7/8	14.9	-	-	14 1/2	36.8	1 1/4	3.2	1 5/8	4.1	5 1/8	3 1/2	8.9
RO-30	12	30.5	12 1/2	31.8	16	40.6	4 5/8	11.8	4 5/8	11.8	6 1/2	6 1/2	16.5
RO-31	4 7/8	12.4	4 7/8	12.4	13 3/4	34.9	1 1/4	3.2	1 1/4	3.2	4 3/8	4 3/8	11.1
RO-32	3 3/8	8.6	5 1/2	14.0	10 3/4	27.3	3/4	1.9	3/4	1.9	5 1/8	5 1/8	13.0
RO-33	4 5/8	11.8	6 1/4	15.9	13 1/8	33.3	1 3/8	3.5	1 3/8	3.5	5	5	12.7
RO-34	5 1/4	13.3	5 3/8	13.6	13 1/2	34.3	1 1/4	3.2	1 1/4	3.2	4 3/8	4 3/8	11.1
RO-35	6 5/8	16.8	6 5/8	16.8	9 7/8	25.1	1/2	1.3	1/2	1.3	3 1/4	3 1/4	8.3
RO-36	6	15.2	6	15.2	14	35.6	3 1/4	8.3	3 1/4	8.3	5 1/8	5 1/8	13.0
RO-37	6 5/8	16.8	6 5/8	16.8	11	27.9	1 3/4	4.4	1 3/4	4.4	4 3/4	4 3/4	12.1
RO-38	2 1/2	6.4	4 1/4	10.8	14 1/2	36.8	1 3/4	4.4	1 3/4	4.4	4 3/4	4 3/4	12.1
RO-39	1/4	0.6	9 3/8	23.8	16 1/2	41.9	1 1/2	3.8	2	5.1	3 5/8	4 3/4	12.1
RO-40	14	35.6	14 1/2	36.8	14 3/4	37.5	3 1/4	8.3	2 1/2	6.4	9	6 3/8	16.2
RO-41	5 3/8	13.6	5 1/2	14.0	21 1/2	54.6	1 1/8	2.9	1 1/8	2.9	5 1/8	5 1/8	13.0
RO-42	5	12.7	6 5/8	16.8	13	33.0	1	2.5	1	2.5	4 7/8	4 7/8	12.4
RO-43	7 7/8	20.0	-	-	17 3/4	45.1	3 3/4	9.5	6	15.2	5	6 3/4	17.1
RO-44	11	27.9	10 3/4	27.3	19 1/2	49.5	1 1/4	3.2	1 1/4	3.2	4 3/4	4 3/4	12.1
RO-45	9	22.9	9	22.9	16	40.6	1/2	1.3	1/2	1.3	2	5.1	5.1

Table 2a. Continued

Specimen Number	Distance Between Wheels		Wheel Base		Thickness of Wheels		Diameter of Wheels				
	Front in	Back cm	in	cm	Front in	Back in	Front in	Back in			
RO-46	-	-	18 1/2	47.0	2	5.1	3	6	15.2	6	15.2
RO-47	-	-	24	61.0	1	2.5	1	6	15.2	7 1/2	19.0
RO-48	2 1/2	6.4	11 1/2	29.2	3/4	1.9	3/4	3	7.6	3	7.6
RO-49	4 1/2	11.4	15	38.1	1 1/4	3.2	1 1/4	5	12.7	5'	12.7
RO-50	3 1/2	8.9	12 1/2	31.8	2	5.1	2	4 1/2	11.4	4 1/2	11.4
RO-51	7 1/2	19.0	18	45.7	3/4	1.9	3/4	5 1/4	13.3	5 1/4	13.3
RO-52	11 1/2	29.2	17	43.2	2 1/4	5.7	2 1/4	4 3/4	12.1	4 3/4	12.1
RO-53	9 3/4	24.8	20	50.8	2 1/4	5.7	2 1/4	4 3/4	12.1	4 3/4	12.1
RO-54	-	-	40	101.6	2	5.1	4	14	35.6	9 1/2	24.1
RO-55	-	-	35 1/2	90.2	1 3/4	4.4	4 1/4	12	30.5	11 1/2	29.2
RO-56	16 1/2	41.9	25 3/4	65.4	1 1/4	3.2	1 1/4	8 1/4	21.0	12	30.5
RO-57	14	35.6	18 3/4	47.6	3 3/4	9.5	4	8	20.3	12 3/4	32.4
RO-58	-	-	33	83.8	2 3/4	7.0	4 3/4	9 1/2	24.1	11 1/2	29.2
RO-59	1	2.5	26 1/4	66.7	1 1/4	3.2	1 3/4	7	17.8	14 1/4	36.2

NOTE: All toys have four wheels except the following: Nos. RO-21 and RO-23 have six wheels; No. RO-13 has five wheels; Nos. RO-7, RO-12, RO-18, RO-19, RO-29, RO-43, RO-46, RO-47, RO-54, RO-55 and RO-58 have three wheels; No. RO-5 has two wheels.

a/ The measurements given are for the four wheels under the toy. There are two large side wheels that are visible and give support. The measurements for these wheels are: distance between wheels - 5", thickness of wheels - 1 3/8", and diameter of wheels - 4 5/8".

Table 3. Measurements of Body Dimensions of Ride-In Toys

Specimen Number	Weight		Height		Length		Width		Seat Width		Seat Height	
	lb	kg	in	cm	in	cm	in	cm	in	cm	in	cm
RI-1	7.3	3.3	12 1/2	31.8	23	58.4	16	40.6	9 1/2	24.1	6 1/2	16.5
RI-2	6.5	2.9	15 1/2	39.4	21	53.3	16	40.6	7	17.8	8	20.3
RI-3	8.0	3.6	10	25.4	22 1/2	57.2	16 1/2	41.9	11	27.9	4 1/4	10.8
RI-4	9.9	4.5	11 5/8	29.5	39	99.1	22	55.9	9 1/2	24.1	6	15.2
RI-5	7.7	3.5	12 1/4	31.1	37	94.0	17	43.2	8 1/2	21.6	5	12.7
RI-6	15.4	7.0	17	43.2	39	99.1	22	55.9	11	27.9	7	17.8
RI-7	13.4	6.1	19 7/8	50.5	41	104.1	18 1/2	47.0	10 1/2	26.7	6 3/4	17.1
RI-8	17.4	7.9	18	45.7	36	91.4	20	50.8	10	25.4	7	17.8
RI-9	10.7	4.8	14 1/4	36.2	32	81.3	20	50.8	11	27.9	8	20.3
RI-10	14.7	6.7	17 1/2	44.4	34 3/4	88.3	18 1/2	47.0	10	25.4	7	17.8
RI-11	6.9	3.2	15	38.1	27	68.6	16 1/2	41.9	9 3/4	24.8	5 1/2	14.0
RI-12	20.8	9.4	20 1/2	52.1	43 1/2	110.5	24 1/2	62.2	8	20.3	8 1/2	21.6
RI-13	18.2	8.3	18 1/2	47.0	34	86.4	16 1/2	41.9	13	33.0	8	20.3
RI-14	9.7	4.4	18 1/2	47.0	34	86.4	17 3/4	45.1	10	25.4	7	17.8
RI-15	21.5	9.8	17 1/2	44.4	43	109.2	26	66.0	11	27.9	8 1/4	21.0

Table 3a. Measurements of Wheels and Wheel Base of Ride-In Toys

Specimen Number	Distance Between Wheels		Wheel Base		Thickness of Wheels		Diameter of Wheels							
	Front in	Back cm	in	cm	Front in	Back cm	Front in	Back cm						
RI-1	10	25.4	8 1/4	21.0	20 1/2	52.1	3	7.6	4	10.2	4 1/2	11.4	5 1/2	14.0
RI-2	7 1/2	19.0	10 3/4	27.3	14 1/4	36.8	1 1/4	3.2	1 3/8	3.5	4 7/8	12.4	5 3/4	14.6
RI-3	2 5/8	6.7	10 1/8	25.7	10 1/2	26.7	1 1/8	2.9	1 1/8	2.9	2	5.1	2	5.1
RI-4	15 3/8	39.0	15	38.1	24 1/2	62.2	2 3/4	7.0	3 1/2	8.9	6	15.2	7	17.8
RI-5	14 5/8	37.2	13 1/2	34.3	20	50.8	1	2.5	1 1/4	3.2	5 1/4	13.3	6	15.2
RI-6	15 1/2	39.4	15	38.1	23	58.4	3 1/2	8.9	3 1/2	8.9	7 3/4	19.7	7 3/4	19.7
RI-7	12 1/2	31.8	13 1/4	33.7	22 1/4	56.5	2 3/4	7.0	2 3/4	7.0	6 3/4	17.1	6 3/4	17.1
RI-8	15 3/4	40.0	14 3/8	36.5	27 1/4	69.2	1 1/4	3.2	1 1/4	3.2	7 1/4	18.4	10	25.4
RI-9	14	35.6	11 1/2	29.2	23 1/2	59.7	2	5.1	4 1/2	11.4	6 3/8	16.2	9	22.9
RI-10	13	33.0	14	35.6	22	55.9	2 1/2	6.4	2 1/2	6.4	6 3/4	17.1	6 3/4	17.1
RI-11	13 1/2	34.3	12 1/2	31.8	16 3/4	42.5	1	2.5	1	2.5	5 7/8	14.9	5 7/8	14.9
RI-12	15 1/4	38.7	17	43.2	33 1/4	84.5	3 1/2	8.9	4	10.2	7 3/4	19.7	9 3/4	24.8
RI-13	12	30.5	10 1/2	26.7	24 1/2	62.2	3/4	1.9	3/4	1.9	7 1/2	19.0	7 1/2	19.0
RI-14	10 1/2	26.7	12 1/4	31.1	26 3/4	67.9	1 3/4	4.4	1	2.5	4	10.2	10	25.4
RI-15	16 1/2	42.0	18 1/2	47.0	27	68.6	3 1/2	8.9	4	10.2	8	20.3	10	25.4

NOTE: All toys have four wheels.

Table 4. Measurements of Body Dimensions of Wagons

Specimen Number	Weight		Height		Length		Width		Overall			
	lb	kg	Bottom	Top Edge	in	cm	in	cm				
W-1	4.4	2.0	5 1/2	14.0	8	20.3	19	48.3	9 1/4	23.5	12 1/2	31.8
W-2	7.6	3.5	6 3/4	17.1	9 3/4	24.8	23 1/4	59.1	10 1/2	26.7	13	33.0
W-3	7.3	3.3	5 1/2	14.0	9 1/4	23.5	27 1/2	69.8	10 1/2	26.7	19 1/2	49.5
W-4	16.8	7.6	8	20.3	11 1/2	29.2	32 1/2	82.6	11 3/4	29.8	15 1/2	39.4
W-5	4.9	2.2	4	10.2	7 3/4	19.7	20 1/2	52.1	8	20.3	16 1/2	41.9
W-6	6.0	2.7	6	15.2	8 1/2	21.6	19 1/2	49.5	9	22.9	12 1/2	31.8
W-7	12.6	5.7	6 1/4	15.9	14 1/2	36.8	22	55.9	8 1/4	21.0	16	40.6
W-8	4.5	2.1	3	7.6	6 1/4	15.9	12 3/4	32.4	8	20.3	13 1/2	34.3
W-9	0.8	0.3	3 1/4	8.3	5	12.7	12 1/2	31.8	7	17.8	8	20.3
W-10	11.2	5.1	6 1/2	16.5	9 7/8	25.1	17 3/4	45.1	17 3/4	45.1	18 1/2	47.0
W-11	4.4	2.0	4	10.2	8 1/2	21.6	20	50.8	9	22.9	14	35.6
W-12	19.0	8.6	9 3/4	24.8	13 3/4	34.9	40	101.6	14	35.6	17 1/4	43.8
W-13	22.8	10.3	10 1/4	26.0	14 1/2	36.8	41	104.1	14 1/2	36.8	17	43.2
W-14	32.0	14.5	10 1/2	26.7	19 3/4	50.2	42 1/2	108.0	13 1/2	34.3	15	38.1

Table 4a. Measurements of Wheels and Wheel Base of Wagons

Specimen Number	Distance Between Wheels		Wheel Base		Thickness of Wheels		Diameter of Wheels	
	Front in	Back cm	in	cm	Front in	Back cm	Front in	Back cm
W-1	8 3/8	21.3	8 3/8	21.3	1 3/4	4.4	4 3/4	12.1
W-2	9 3/8	23.8	9 3/8	23.8	1 1/2	3.8	6	15.2
W-5	10 1/4	26.0	11	27.9	3 3/8	8.6	6	15.2
W-4	11 3/4	29.8	11 3/4	29.8	1 1/4	3.2	7	17.8
W-5	9 7/8	25.1	11 1/8	28.3	2 3/4	7.0	6	15.2
W-6	9 3/4	24.8	9 7/8	25.1	5/8	1.6	5 1/4	13.3
W-7	12	30.5	12	30.5	1 1/4	3.2	5 3/4	14.6
W-8	10	25.4	10	25.4	1 1/4	3.2	5	12.7
W-9	5 5/8	14.3	6	15.2	5/8	1.6	2 3/4	7.0
W-10	9 1/2	24.1	14	35.6	1 1/4	3.2	6	15.2
W-11	12	30.5	12	30.5	1 1/4	3.2	4 7/8	12.4
W-12	13	33.0	13	33.0	1 1/4	3.2	8 1/4	21.0
W-13	12 1/2	31.8	12 1/2	31.8	1 1/2	3.8	9 1/2	24.1
W-14	13	33.0	13	33.0	1 1/2	3.8	9 3/4	24.8

NOTE: All wagons have four wheels except W-10. This wagon has a fifth wheel at its back which is positioned behind the backrest.

Table 5. Static Stability Test Frequency Distributions
for Ride-On Toys

Tilt Angle Range Degrees	Toys w/max. Age		Total No. of Toys	
	Rating of 3 yrs. Old	Rating of 4-8 yrs. Old	Rated 3-8 yrs. Old	
Tipped in Forward Direction				
0-4.9				
5-9.9				
10-14.9	1		1	(2)
15-19.9	4		4	(7)
20-24.9	6	1	7	(13)
25-29.9	5	6	11	(20)
30-34.9	9	6	15	(28)
35 & over	5	11	16	(30)
Totals			54	(100)
Tipped in Backward Direction				
0-4.9	1		1	(2)
5-9.9	4		4	(7)
10-14.9	9	5	14	(25)
15-19.9	8	5	13	(24)
20-24.9	6	6	12	(22)
25-29.9	3	4	7	(13)
30-34.9		4	4	(7)
35 & over				
Totals			55	(100)
Tipped in Sideways Direction				
0-4.9	3	1	4	(7)
5-9.9	12	5	17	(31)
10-14.9	13	9	22	(40)
15-19.9	2	3	5	(9)
20-24.9		4	4	(7)
25-29.9	1	2	3	(6)
30-34.9				
35 & over				
Totals			55	(100)

Note: Numbers in parentheses denote percentage.

Table 6. Static Stability Test Frequency Distributions
for Ride-In Toys

Tilt Angle Range Degrees	Toys w/max. Age Rating of 3 yrs. Old	Toys w/max. Age Rating of 4-8 yrs. Old	Total No. of Toys Rated 3-8 yrs. Old
Tipped in Forward Direction			
0-4.9			
5-9.9			
10-14.9			
15-19.9			
20-24.9			
25-29.9			
30-34.9			
35 & over	2	12	14 (100)
Totals			14 (100)
Tipped in Backward Direction			
0-4.9			
5-9.9		1	1 (7.2)
10-14.9	1	4	5 (36)
15-19.9	1	2	3 (21)
20-24.9		2	2 (14.3)
25-29.9		2	2 (14.3)
30-34.9		1	1 (7.2)
35 & over			
Totals			14 (100)
Tipped in Sideways Direction			
0-4.9			
5-9.9			
10-14.9			
15-19.9	1	1	2 (14.3)
20-24.9		1	1 (7.2)
25-29.9	1	3	4 (28.6)
30-34.9		3	3 (21.3)
35 & over		4	4 (28.6)
Totals			14 (100)

Note: Numbers in parentheses denote percentage.

Table 7. Static Stability Test Frequency Distributions
for Wagons with Front Wheels Straight

Tilt Angle Range Degrees	Toys w/max. Age		Total No. of toys	
	Rating of 3 yrs. Old	Rating of 4-8 yrs. Old	Rated 3-8 yrs. Old	
Tipped in Forward Direction				
0-4.9				
5-9.9				
10-14.9				
15-19.9				
20-24.9				
25-29.9		1	1	(9)
30-34.9				
35 & over	1	9	10	(91)
Totals			11	(100)
Tipped in Backward Direction				
0-4.9				
5-9.9		2*	2*	(18)
10-14.9		1	1	(9)
15-19.9	1	1	2	(18)
20-24.9		1	1	(9)
25-29.9		1	1	(9)
30-34.9		1	1	(9)
35 & over		3	3	(28)
Totals			11	(100)
Tipped in Sideways Direction				
0-4.9				
5-9.9				
10-14.9				
15-19.9		4	4	(36)
20-24.9	1	3	4	(36)
25-29.9		3	3	(28)
30-34.9				
35 & over				
Totals			11	(100)

*Note: One of these units is equipped with a fifth wheel at its rear to prevent passenger from tipping completely over in backward direction. Wagon tips at 20° when resting on fifth wheel.

Numbers in parentheses denote percentage.

Table 8. Composite Static Stability Test Frequency Distributions for All Toys Tested with an Age Rating of 3-8 Years Old

Tilt Angle Range Degrees	Forward Direction		Backward Direction		Sideways Direction	
	Number of Occurrences	%	Number of Occurrences	%	Number of Occurrences	%
0-4.9			1	1.3	4	5.0
5-9.9			7	8.7	17	21.3
10-14.9	1	1.3	20	25.0	22	27.5
15-19.9	4	5.0	18	22.5	11	13.8
20-24.9	7	8.9	15	18.8	9	11.2
25-29.9	12	15.2	10	12.5	10	12.5
30-34.9	15	19.0	6	7.5	3	3.7
35 & over	40	50.6	3	3.7	4	5.0
Totals	79	100	80	100	80	100

Table 9. Toy Failures During Static Stability Test

Discrepancy Number	Specimen Number	Failure Description
1	RO-13	Seat collapsed under 18.1 kg (40 lb) test weight.
2	RO-15	Main shaft twists when 18.1 kg (40 lb) weight is mounted causing instability.
3	RO-16	Bolts holding plastic horse to metal frame allowed horse to wobble when weight was mounted, causing instability.
4	RO-22	Wheels flattened under 18.1 kg (40 lb) test weight.
5	RO-25	Toy collapsed under 18.1 kg (40 lb) test weight.
6	RO-27	Toy collapsed under 18.1 kg (40 lb) test weight. (See figure 1)
7	RO-29	The pal nut holding the rear wheel to the body of the toy forced through the plastic wheel, cracking the wheel and causing the toy to be unstable. (See figures 2a and 2b)
8	RO-30	Toy collapsed under the 18.1 kg (40 lb) test weight.
9	RO-32	Toy collapsed under the 18.1 kg (40 lb) test weight. (See figures 3a and 3b)
10	RO-34	Toy collapsed under the 18.1 kg (40 lb) test weight. (See figure 4)
11	RO-36	Toy collapsed under the 18.1 kg (40 lb) test weight.
12	RO-37	Toy collapsed under the 18.1 kg (40 lb) test weight.
13	RO-51	Toy collapsed under the 18.1 kg (40 lb) test weight.
14	W-9	Wagon collapsed under the 18.1 kg (40 lb) test weight.

Table 10. Tabulation of the Number of Toys Tested Which Initially Tipped Over at a Given Obstruction Height and Given Speed During Dynamic Stability Test

Specimen Group	Number Tested	Orientation of Test Specimen	1.2 m/s (4 ft/s)				1.8 m/s (6 ft/s)			
			Obstruction Height		Obstruction Height		Obstruction Height		Obstruction Height	
			0.6 cm (0.25 in) %	1.3 cm (0.5 in) %	2.5 cm (1.0 in) %	0.6 cm (0.25 in) %	1.3 cm (0.5 in) %	2.5 cm (1.0 in) %	2.5 cm (1.0 in) %	
Ride-on Toys	47	Forward	0	4 (8.5)	12 (25.5)	0	6 (12.8)	21 (44.7)		
	34	Backward	2 (5.9)	17 (50.0)	8 (23.5)	3 (8.8)	13 (38.2)	13 (38.2)		
Ride-in Toys	15	Forward	0	0	0	0	0	0		
	14	Backward	0	4 (28.6)	5 (35.7)	0	4 (28.6)	5 (35.7)		
Wagons	12	Forward	0	0	1 (8.3)	0	0	1 (8.3)		
	12	Backward	0	2 (16.7)	4 (33.3)	0	2 (16.7)	5 (41.7)		

Note: Numbers in parentheses denote percentage of number tested.

Table 11. Cumulative Totals of the Number of Toys Tipping Over at Given Obstruction Heights and Given Speeds During Dynamic Stability Test

Specimen Group	Number Tested	Orientation of Test Specimen	1.2 m/s (4 ft/s)			1.8 m/s (6 ft/s)		
			Obstruction Height	Obstruction Height	Obstruction Height	Obstruction Height	Obstruction Height	Obstruction Height
			0.6 cm (0.25 in) %	1.3 cm (0.5 in) %	2.5 cm (1.0 in) %	0.6 cm (0.25 in) %	1.3 cm (0.5 in) %	2.5 cm (1.0 in) %
Ride-on Toys	47	Forward	0 (0)	4 (8.5)	16 (34.0)	0 (0)	6 (12.8)	27 (57.0)
	34	Backward	2 (5.9)	19 (56.0)	27 (79.0)	3 (8.8)	16 (47.0)	29 (85.0)
Ride-in Toys	15	Forward	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	14	Backward	0 (0)	4 (28.6)	9 (64.0)	0 (0)	4 (28.6)	9 (64.0)
Wagons	12	Forward	0 (0)	0 (0)	1 (8.0)	0 (0)	0 (0)	1 (8.0)
	12	Backward	0 (0)	2 (17.0)	6 (50.0)	0 (0)	2 (17.0)	7 (58.0)

Note: Numbers in parentheses denote percentage of number tested.

Table 12. Toy Failures During
Dynamic Stability Tests

Discrepancy Number	Specimen Number	Failure Description
1	RO-4	Pal nut popped off right rear wheel.
2	RO-23	Toy collapsed under 18.1 kg (40 lb) test weight.
3	RO-28	Toy's wheels flattened under 18.1 kg (40 lb) test weight.
4	RO-31	Hand grip broke off when toy ran off test ramp. (See figure 5)
5	RO-33	Toy's rear wheels flattened under 18.1 kg (40 lb) test weight causing toy to be unstable.
6	RO-46	Seat adjustment clip broke off. The 22.7 (50 lb) test weight forces toy frame down on wheels.
7	RO-52	Toy is unstable under 27.2 kg (60 lb) test weight.
8	RO-53	Toy is unstable under 27.2 kg (60 lb) test weight.
9	RI-4	Plastic seat of this toy cracked when 22.7 kg (50 lb) test weight was mounted on seat.
10	W-6	Wagon turned over during 6 ft/s test in backward orientation and bent rear axle.
11	W-7	Wagon bed collapsed under 34 kg (75 lb) test weight.

Table 13. Toy Failure for Stairway Abuse Test

Discrepancy Number	Specimen Number	Failure Description
1	RO-1	Small piece of clamp on ear assembly broke off. (See figure 6)
2	RO-2	Steering wheel came off on 1st and 2nd drops. On 3rd drop, the body split and broke off several alignment studs (plastic pegs). (See figure 7)
3	RO-8	Steering wheel pin bent and became dislodged. (See figure 8)
4	RO-22	Pal nut popped off underside of toy.
5	RO-28	Two pal nuts, holding top and bottom together popped off.
6	RO-35	Protruding cannon barrel broke off, leaving sharp edge. (See figure 9)
7	RO-37	The snap-on front bumper came off, exposing some sharp edges left by mold. (See figure 10)
8	RO-38	Toy cracked on left side, right rear wheel broke from axle leaving sharp edge. (See figures 11a and 11b)
9	RO-41	Small piece broke out of left front wheel. (See figure 12)
10	RO-43	Fan belt broke at top left side. (See figure 13)
11	RO-45	Left hand grip broke leaving sharp edges. (See figure 14)
12	RO-47	Left rear wheel slightly bent.
13	RO-51	One of four pal nuts holding wheel frame to rear of body popped off.
14	RO-52	Broke left hand grip leaving sharp edges. (See figure 15)

Table 13. Continued

Discrepancy Number	Specimen Number	Failure Description
15	RO-55	Cracked plastic seat on backward drop.
16	RO-59	Steering wheel came off, exposing sharp edges. (See figure 16)
17	RI-7	Three of four headlights were knocked off, shearing off small alignment studs which could be swallowed. (See figure 17)
18	RI-11	Steering wheel broke, leaving sharp edges. (See figure 18)
19	W-2	Wagon tongue bent.
20	W-7	Front wheel and axle broke loose from wood frame. Axle was held in place by 2 wood screws which were exposed as a result of this failure. (See figure 19)



Figure 1. Specimen RO-27 collapsing under 18.1 kg (40 lb) test weight.

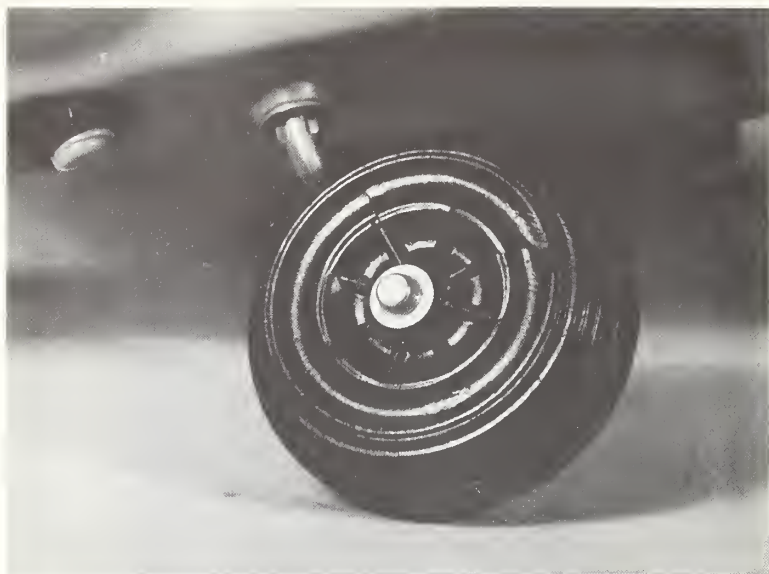
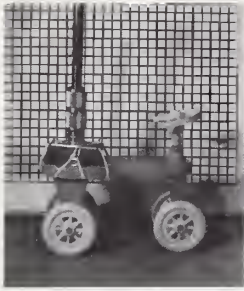


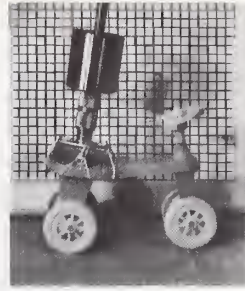
Figure 2a. Rear wheel of RO-29 before testing.



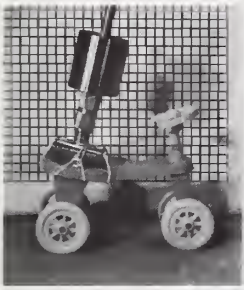
Figure 2b. Rear wheel of RO-29 after collapsing under 18.1 kg (40 lb) test weight during static stability test.



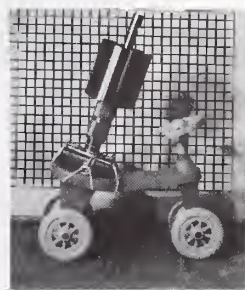
Start



10 seconds

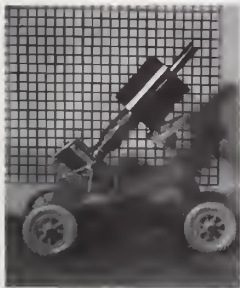


20 seconds

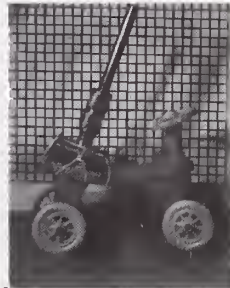


30 seconds

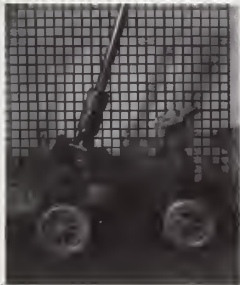
Figure 3a. RO-32 collapsing after mounting 18.1 kg (40 lb) test weight for static stability test.



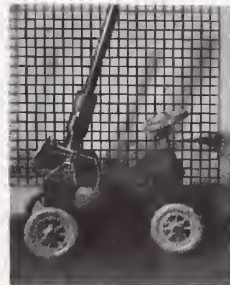
Start



10 seconds



20 seconds



30 seconds

Figure 3b. Recovery of RO-32 after removing 13.6 kg (30 lb) from the 18.1 kg (40 lb) test weight.



Figure 4. Specimen R0-34 collapsing under 18.1 kg (40 lb) test weight.



Figure 5. Broken hand grip of RO-31 which occurred during dynamic stability test.



Figure 6. Small piece of ear assembly from RO-1 which broke during abuse test (possible ingestion hazard).



Figure 7. Broken alignment pegs from RO-2 which occurred during abuse test (possible ingestion hazard).

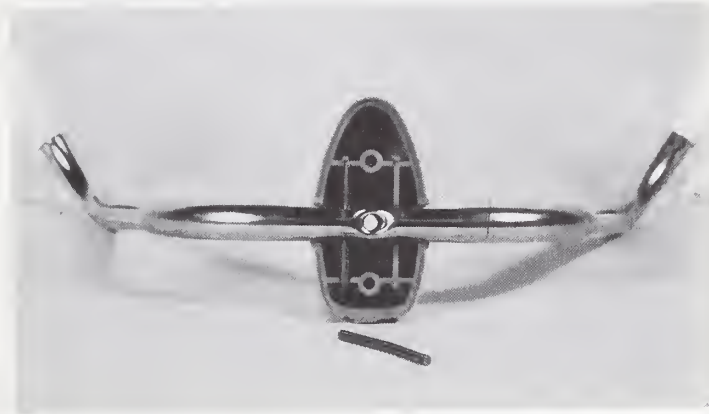


Figure 8. Loose pin from RO-8 which became dislodged during abuse test (possible ingestion hazard).



Figure 9. Sharp edges resulting from broken cannon barrel on RO-35. Failure occurred during abuse test.

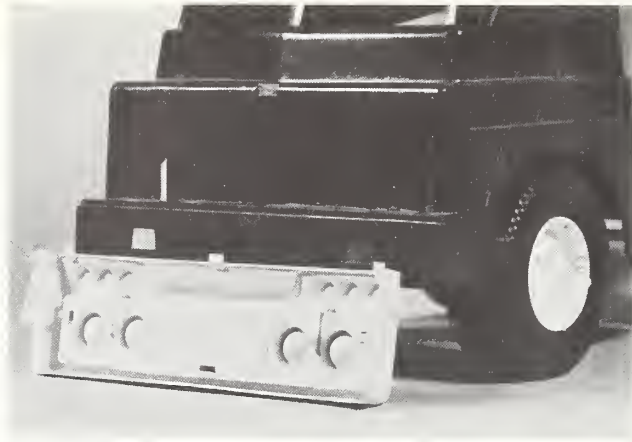


Figure 10. Sharp edges of bumper which became dislodged from RO-37 during abuse test.



(a)



(b)

Figure 11. Axle (a) of RO-38 to which molded wheel (b) was attached prior to abuse test. This failure resulted in exposed sharp edges.

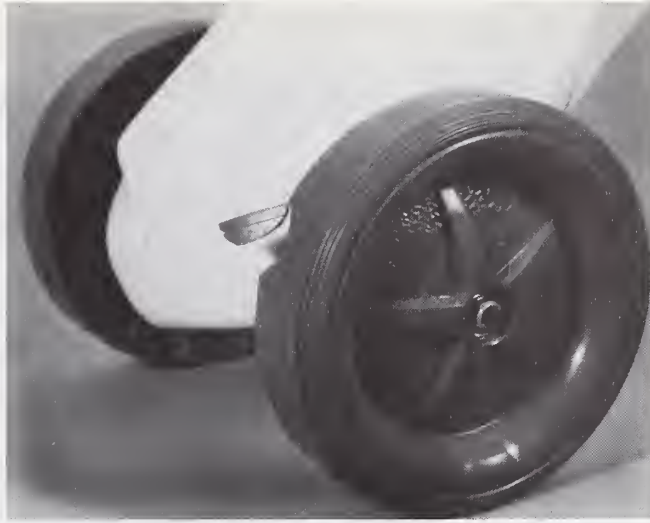


Figure 12. Broken wheel on RO-41 resulting from abuse test (possible ingestion hazard).



Figure 13. Broken fan belt on RO-43 which occurred during abuse test.



Figure 14. Sharp edges resulting from broken hand grip on RO-45 which occurred during abuse test.



Figure 15. Splintered hand grip on RO-52 which occurred during abuse test.



Figure 16. Jagged edges of metal steering wheel broken from R0-59 during abuse test.

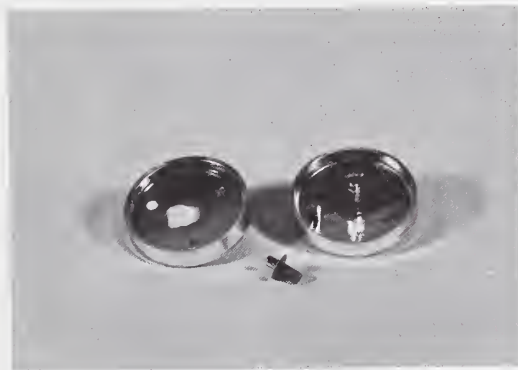


Figure 17. Headlight from RI-7 which was dislodged when small alignment stud was sheared during abuse test.



Figure 18. Sharp edges exposed when steering wheel of RI-11 broke during abuse test.



Figure 19. Sharp ends of screws which were exposed after wheel and axle assembly of W-7 pulled loose from wood frame during abuse test.



Figure 20. Assortment of different types of Pal nuts (cap nuts), which were dislodged during testing.

Appendix A.

Photographs of Test Specimens



RO-1



RO-2



RO-3



RO-4



RO-5



RO-6



RO-7



RO-8



RO-9



RO-10



RO-11



RO-12



RO-13



RO-13 BOTTOM



RO-14



RO-15



RO-16



RO-17



RO-18



RO-19



RO-20



RO-21



RO-22



RO-23



RO-23 BOTTOM



RO-24



RO-25



RO-26



RO-27



RO-28



RO-29



RO-30



RO-31



RO-32



RO-33



RO-34



RO-35



RO-35 BOTTOM



RO-36



RO-37



RO-38



RO-39



RO-40



RO-41



RO-42



RO-43



RO-44



RO-45



RO-46



RO-47



RO-48



RO-49



RO-50



RO-51



RO-52



RO-53



ONE FOOT

RO-54



ONE FOOT

RO-55



ONE FOOT

RO-56



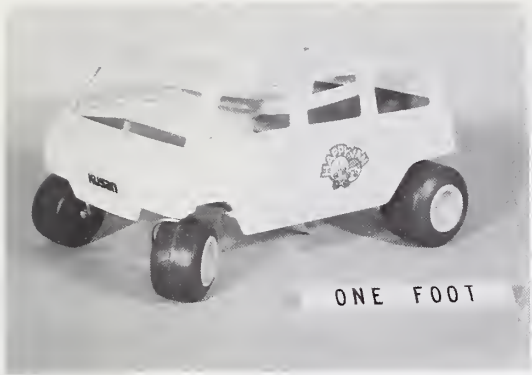
RO-57



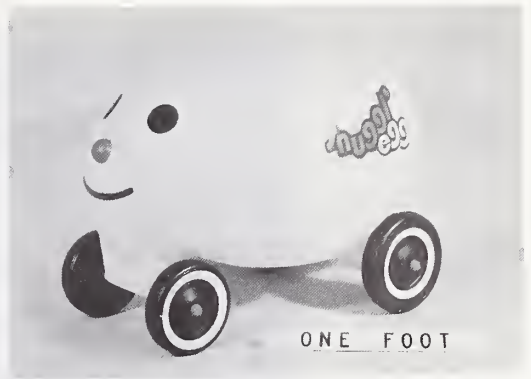
RO-58



RO-59



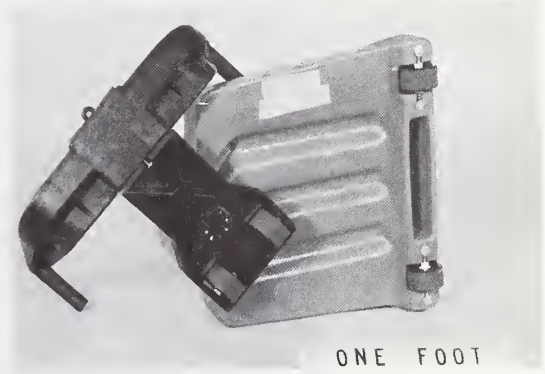
RI-1



RI-2



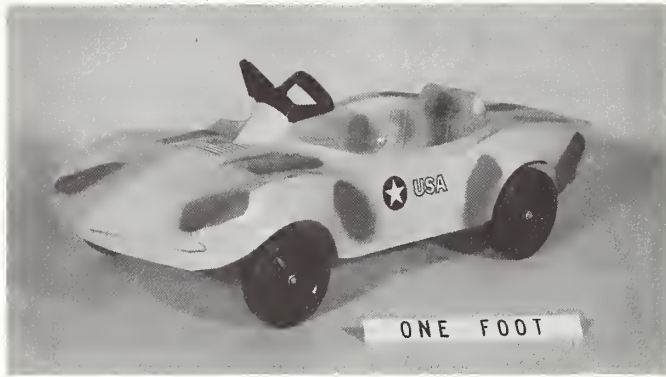
RI-3



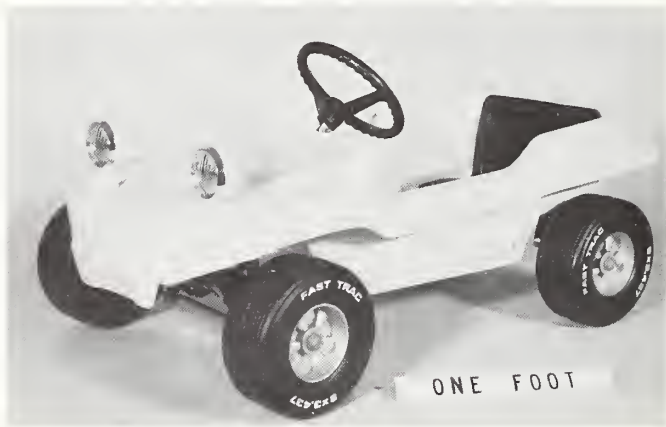
RI-3 BOTTOM



RI-4



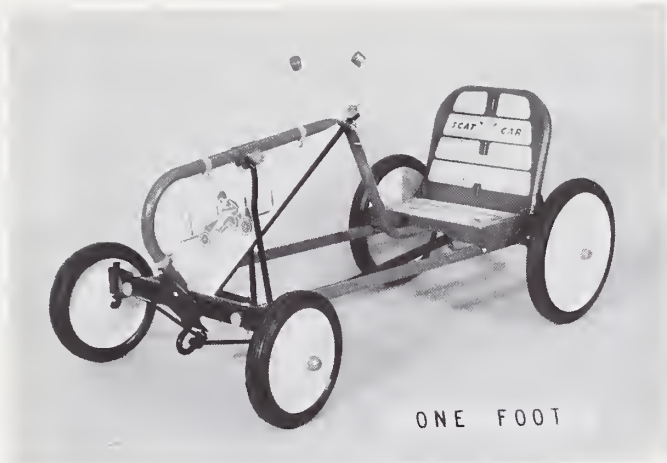
RI-5



RI-6



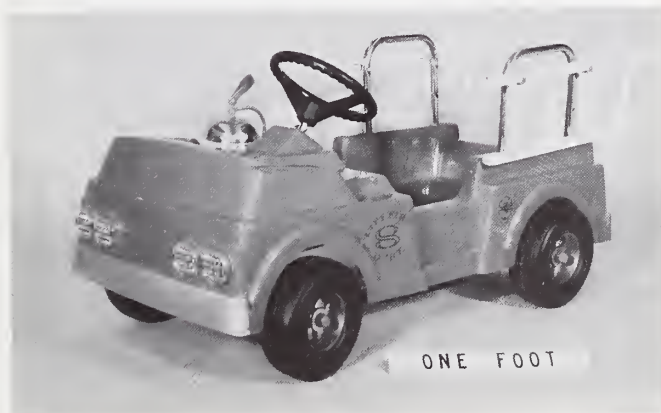
RI-7



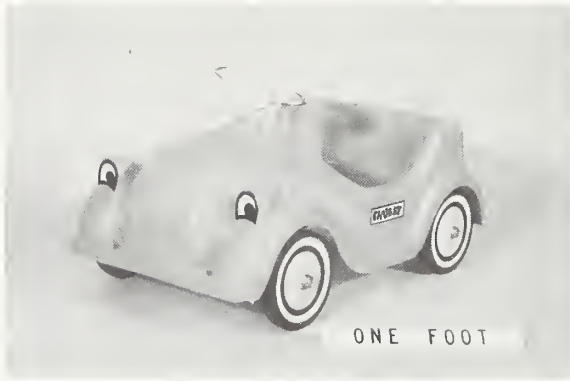
RI-8



RI-9



RI-10



RI-11



RI-12



RI-13



RI-14



RI-15



W-1



W-2



W-3



W-4



W-5



W-6



W-7



W-8



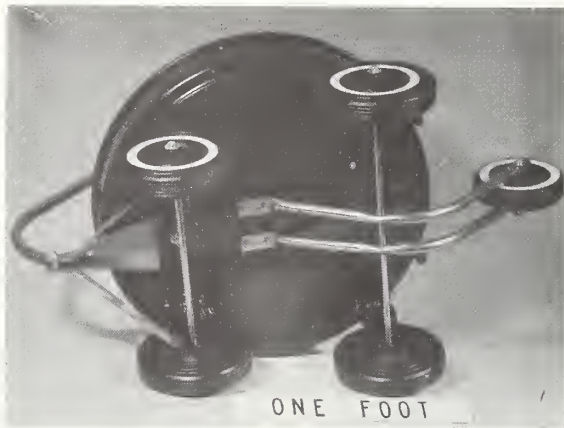
W-9



W-10



W-10 REAR



W-10 BOTTOM



W-11



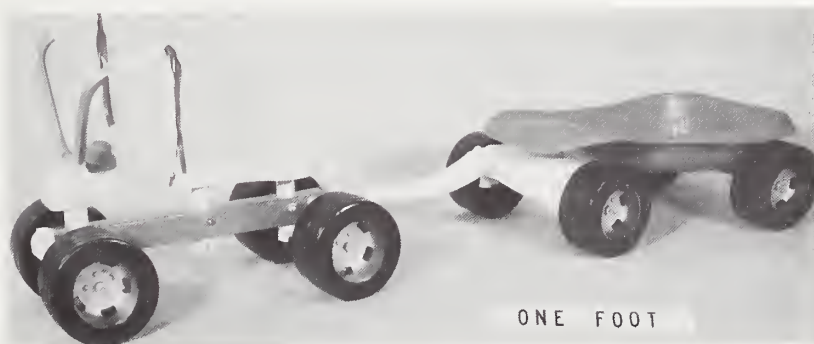
W-12



W-13



W-14



RO-15 and W-5

Appendix B.

Stability Test Data

Table B-1. Static Stability Test Results for Ride-On Toys

<u>Specimen Number</u>	<u>Test Weight</u>		<u>Sideways Tilt Angle degrees</u>	<u>Backward Tilt Angle degrees</u>	<u>Forward Tilt Angle degrees</u>
	lb	kg			
RO-1	40	18.1	9.8	17.5	18.0
RO-2	40	18.1	8.2	8.2	33.0
RO-3	40	18.1	9.8	12.5	18.0
RO-4	40	18.1	11.0	15.0	31.5
RO-4	50	22.7	9.0	17.0	25.5
RO-5 (a)					
RO-6	40	18.1	16.0	14.0	35+
RO-6	50	22.7	16.0	12.0	29.0
RO-7	40	18.1	7.1	25.0	35+
RO-7	55	25.0	8.0	23.0	34.0
RO-8	40	18.1	11.0	14.0	35+
RO-9	40	18.1	11.5	12.5	35+
RO-9	50	22.7	11.0	12.0	34.5
RO-10	40	18.1	13.5	11.0	34.2
RO-10	50	22.7	14.0	10.0	34.5
RO-11	40	18.1	10.2	15.0	35.0
RO-11	50	22.7	9.0	19.0	30.0
RO-12	40	18.1	10.0	31.0	35+
RO-12	60	27.2	12.0	28.0	35+
RO-13	40	18.1	10.0	9.0	32.0
RO-14	40	18.1	12.6	15.5	24.0
RO-15	40	18.1	9.6	20.5	35+
RO-15 (c)	50	22.7			
RO-16	40	18.1	3.8	20.0	29.0
RO-17	40	18.1	12.0	25.0	28.0
RO-17	55	25.0	10.0	24.0	29.0
RO-18	40	18.1	15.0	30.0	35+
RO-18	60	27.2	15.0	24.0	35.0
RO-19	40	18.1	11.0	26.0	27.5
RO-20	40	18.1	8.2	11.0	23.0
RO-21	40	18.1	12.8	19.0	16.5
RO-22	40	18.1	17.5	17.0	35+

Table B-1. Continued

Specimen Number	Test Weight		Sideways Tilt Angle degrees	Backward Tilt Angle degrees	Forward Tilt Angle degrees
	lb	kg			
RO-23	40	18.1	6.8	15.0	29.0
RO-24	40	18.1	15.0	11.5	30.0
RO-25	40	18.1	9.2	11.5	29.0
RO-26	40	18.1	10.8	20.0	25.0
RO-27	40	18.1	5.7	17.5	23.0
RO-28	40	18.1	10.8	8.5	35.0
RO-29	40	18.1	4.0	14.0	20.0
RO-30	40	18.1	26.2	15.0	35+
RO-31	40	18.1	5.3	25.5	22.0
RO-32	40	18.1	8.0	4.0	11.0
RO-33	40	18.1	8.1	9.0	32.5
RO-34	40	18.1	7.7	23.0	16.7
RO-35	40	18.1	10.6	14.0	20.3
RO-36	40	18.1	12.4	20.3	(b)
RO-37 (b)	40	18.1			
RO-38 (d)					
RO-39	40	18.1	15.0	27.0	35+
RO-39	55	25.0	14.0	26.0	34.0
RO-40	40	18.1	21.7	21.5	29.7
RO-40	60	27.2	23.0	20.0	28.0
RO-41	40	18.1	4.0	27.0	31.0
RO-42	40	18.1	8.0	18.0	33.0
RO-43	40	18.1	6.0	23.0	35+
RO-43	60	27.2	5.0	20.0	35+
RO-44	40	18.1	8.0	25.3	23.3
RO-44	60	27.2	2.0	31.0	29.0
RO-45	40	18.1	10.0	22.0	27.7
RO-45	55	25.0	11.0	31.0	30.0
RO-46	40	18.1	10.0	13.0	35+
RO-46	50	22.7	10.0	11.0	35+
RO-47	40	18.1	18.5	20.0	35+
RO-47	60	27.2	19.0	17.0	35+
RO-48	40	18.1	10.6	12.0	31.0

Table B-1. Continued

<u>Specimen Number</u>	<u>Test Weight</u>		<u>Sideways Tilt Angle</u> degrees	<u>Backward Tilt Angle</u> degrees	<u>Forward Tilt Angle</u> degrees
	lb	kg			
RO-49	40	18.1	10.5	21.0	31.0
RO-50	40	18.1	14.5	13.0	35.0
RO-51	40	18.1	10.5	23.5	30.0
RO-52	40	18.1	14.2	14.3	29.5
RO-52	60	27.2	10.0	14.0	24.0
RO-53	40	18.1	11.5	29.0	27.0
RO-53	60	27.2	7.0	34.5	28.0
RO-54	40	18.1	28.2	31.5	35+
RO-54	75	34.0	26.0	26.0	35+
RO-55	40	18.1	25.8	35+	35+
RO-55	60	27.2	23.0	27.0	35+
RO-56	40	18.1	28.7	35+	35+
RO-56	75	34.0	25.0	33.0	35+
RO-57	40	18.1	27.5	35+	35+
RO-57	75	34.0	20.0	17.0	35+
RO-58	40	18.1	17.0	14.5	35+
RO-58	75	34.0	13.0	15.0	35+
RO-59	40	18.1	21.8	32.5	35+
RO-59	75	34.0	20.0	20.0	35+

NOTE: The footnotes denoting anomalies in the following tables have the same letter designations (i.e., a, b, c, d, e) in each table, where appropriate.

- (a) Toy is unstable when weight is applied.
- (b) Toy collapsed under test weight.
- (c) Structural or mechanical defect prevented testing.
- (d) Toy design precludes performance of this test.

Table B-2. Static Stability Test Results for Ride-In Toys

Specimen Number	Test Weight		Sideways Tilt Angle degrees	Backward Tilt Angle degrees	Forward Tilt Angle degrees
	lb	kg			
RI-1	40	18.1	26.0	13.0	35+
RI-2	40	18.1	18.0	17.0	35+
RI-3	40	18.1	17.5	25.0	28.0
RI-3	60	27.2	22.0	20.0	35+
RI-4	40	18.1	35+	34.0	35+
RI-4	50	22.7	35+	30.0	35+
RI-5	40	18.1	28.8	16.3	35+
RI-5	50	22.7	31.0	24.0	35+
RI-6	40	18.1	35+	21.0	35+
RI-6	60	27.2	35+	9.0	35+
RI-7	40	18.1	32.0	15.0	35+
RI-7	60	27.2	30.0	10.0	35+
RI-8	40	18.1	31.5	35+	35+
RI-8	75	34.0	27.0	25.0	35+
RI-9	40	18.1	29.5	22.5	35+
RI-9	60	27.2	26.0	17.0	35+
RI-10	40	18.1	31.0	14.0	35+
RI-10	60	27.2	30.0	10.0	35+
RI-11	40	18.1	27.5	16.0	35+
RI-11	50	22.7	27.0	16.0	35+
RI-12	40	18.1	35+	35+	35+
RI-12	75	34.0	35+	27.0	35+
RI-13	40	18.1	24.5	27.5	35+
RI-13	75	34.0	18.0	11.0	35+
RI-14	40	18.1	27.0	23.0	35+
RI-14 (c)	65	29.5			
RI-15	40	18.1	35+	27.0	35+
RI-15	75	34.0	35+	13.0	35+

(c) Structural or mechanical defect prevented testing.

Table B-3. Static Stability Test Results for Wagons with Front Wheels Straight

Specimen Number	Distance Weight Mounted		Test Weight		Forward Direction		Tilt Angle		Sideways Direction
	From Rear Edge*	in	lb	kg	degrees	Backward Direction	degrees		
W-1	16.2	6 3/8	40	18.1	35+	20.0	17.0		
W-1			50	22.7	35+	19.0	18.0		
W-2	19.7	7 3/4	40	18.1	35+	27.5	21.0		
W-2			55	25.0	35+	24.0	16.0		
W-3	on seat		40	18.1	35+	11.0	32.7		
W-3			60	27.2	35+	7.0	27.0		
W-4	22.9	9	40	18.1	35+	35+	25.0		
W-4			75	34.0	35+	30.0	19.5		
W-5	on seat		40	18.1	35+	25.0	24.0		
W-5 (d)			50	22.7					
W-6	16.2	6 3/8	40	18.1	35+	22.0	21.0		
W-6			60	27.2	35+	15.0	17.0		
W-7	18.7	7 3/8	40	18.1	35+	29.0	26.0		
W-7 (b)			75	34.0					
W-8	10.8	4 1/4	40	18.1	35+	19.0	24.5		
W-9 (b)			40	18.1					
W-10	17.8	7	40	18.1	34.0	18.0	26.0		
W-10			75	34.0	35+	6.0**	27.0		
W-11	16.5	6 1/2	40	18.1	35+	33.0	32.2		
W-11			50	22.7	26.0	26.0	26.0		
W-12	27.9	11	40	18.1	35+	35+	24.0		
W-12			75	34.0	35+	35+	23.0		
W-13	29.2	11 1/2	40	18.1	35+	35+	25.0		
W-13			75	34.0	35+	35+	22.0		
W-14	29.2	11 1/2	40	18.1	35+	35+	25.0		
W-14			75	34.0	35+	35+	21.0		

*When testing wagons, the test weight was mounted 1/3 of the distance from the rear edge to the front of the wagon (if the wagon had no seat).

**This wagon is equipped with a fifth wheel at its rear to prevent passenger from tipping completely over in backward direction.

(b) Toy collapsed under test weight.

(d) Toy design precludes performance of this test.

Table B-4. Static Sideways Stability Test Results for Wagons at Different Steering Angles

Specimen Number	Distance Weight Mounted From Rear Edge		Test Weight		Steering Angle degrees	Sideways Tilt Angle degrees
	cm	in	lb	kg		
W-1	16.2	6 3/8	40	18.1	30	14.5
					45	12.0
			60	12.0		
			90	14.5		
	50	22.7	40	18.1	30	15.6
					45	12.0
			60	11.0		
			90	13.0		
W-2	19.7	7 3/4	40	18.1	35	21.0
					70*	20.0
			55	25.0	35	16.0
					70*	15.0
W-3	on seat	40	18.1	15	31.0	
				30*	31.0	
		60	27.2	15	26.0	
				30*	26.0	
W-4	22.9	9	40	18.1	30	20.5
					45	19.5
			60	17.0		
			90	17.0		
	75	34.0	40	18.1	30	17.0
					45	15.0
			60	15.0		
			90	15.0		
W-5	on seat	40	18.1	20	23.0	
				40*	21.0	
W-6	16.2	6 3/8	40	18.1	30	16.5
					45	15.0
			60	14.0		
			90	14.0		
	60	27.2	40	18.1	30	16.0
					45	15.0
			60	14.0		
			90	15.0		
W-7	18.7	7 3/8	40	18.1	25	25.0
					50*	25.0
W-8 (f)	10.8	4 1/4	40	18.1		
W-9 (b)			40	18.1		
W-10	17.8	7	40	18.1	30	26.0
					60*	26.0
			75	34.0	30	27.0
60*	27.0					

Table B-4. Continued

Specimen Number	Distance Weight Mounted From Rear Edge		Test Weight		Steering Angle degrees	Sideways Tilt Angle degrees
	cm	in	lb	kg		
W-11 (f)	16.5	6 1/2	40	18.1		
			50	34.0		
W-12	27.9	11	40	18.1	30	23.5
					45	21.0
					60	17.5
					90	17.0
			75	34.0	30	21.0
					45	20.0
					60	17.0
					90	15.0
W-13	29.2	11 1/2	40	18.1	30	21.5
					45	18.0
					60	17.0
					90	17.0
			75	34.0	30	19.0
					45	17.0
					60	16.0
					90	15.0
W-14	29.2	11 1/2	40	18.1	30	23.5
					45	22.0
					60	19.0
					90	16.0
			75	34.0	30	20.0
					45	17.5
					60	16.0
					90	14.0

*Maximum steering angle.

(b) Wagon collapsed under test weight.

(f) Wheels are fixed in straight position.

Table B-5. Continued

Specimen Number	Test Weight lb kg	One Wheel Impact						Two Wheel Impact								
		1.2 m/s (4 ft/s) Obstruction Height			1.8 m/s (6 ft/s) Obstruction Height			1.2 m/s (4 ft/s) Obstruction Height			1.8 m/s (6 ft/s) Obstruction Height					
		0.6 cm (0.25 in)	1.3 cm (0.5 in)	2.5 cm (1.0 in)	0.6 cm (0.25 in)	1.3 cm (0.5 in)	2.5 cm (1.0 in)	0.6 cm (0.25 in)	1.3 cm (0.5 in)	2.5 cm (1.0 in)	0.6 cm (0.25 in)	1.3 cm (0.5 in)	2.5 cm (1.0 in)			
RO-56	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RO-56	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RO-57	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RO-57	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RO-58	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RO-58	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RO-59	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RO-59	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

• 0 - Toy rolled over obstruction.

S - Toy impacted obstruction and stopped without tipping over.

T - Toy impacted obstruction and tipped over.

(a) Toy is unstable when weight is applied.

(b) Toy collapsed under test weight.

(c) Structural or mechanical defect prevented testing.

(d) Toy design precludes performance of this test.

Table B-6. Results of Dynamic Stability Tests on Ride-On Toys, Backward Orientation

Specimen Number	Test Weight lb kg	One Wheel Impact						Two Wheel Impact						
		1.2 m/s (4 ft/s) Obstruction Height			1.8 m/s (6 ft/s) Obstruction Height			1.2 m/s (4 ft/s) Obstruction Height			1.8 m/s (6 ft/s) Obstruction Height			
		0.6 cm (0.25 in)	1.3 cm (0.5 in)	2.5 cm (1.0 in)	0.6 cm (0.25 in)	1.3 cm (0.5 in)	2.5 cm (1.0 in)	0.6 cm (0.25 in)	1.3 cm (0.5 in)	2.5 cm (1.0 in)	0.6 cm (0.25 in)	1.3 cm (0.5 in)	2.5 cm (1.0 in)	
RO-1	40	18.1	T	T	T	T	0	0	T	T	0	0	T	T
RO-2 (e)	40	18.1	T	T	T	T	T	T	T	T	T	T	T	T
RO-3	40	18.1	T	T	T	T	0	0	T	T	0	0	T	T
RO-4	40	18.1	T	T	T	T	0	0	T	T	0	0	T	T
RO-4	50	22.7	0	T	T	T	0	0	T	T	0	0	T	T
RO-5 (a)	40	18.1	0	T	T	T	0	0	T	T	0	0	T	T
RO-6	40	18.1	0	T	T	T	0	0	T	T	0	0	T	T
RO-6 (e)	50	22.7	0	T	T	T	0	0	T	T	0	0	T	T
RO-7	40	18.1	T	T	T	T	T	T	T	T	T	T	T	T
RO-7	55	25.0	0	T	T	T	0	0	T	T	0	0	T	T
RO-8	40	18.1	0	T	T	T	0	0	T	T	0	0	T	T
RO-9	40	18.1	0	T	T	T	0	0	T	T	0	0	T	T
RO-9 (e)	50	22.7	0	T	T	T	0	0	T	T	0	0	T	T
RO-10 (e)	40	18.1	0	T	T	T	0	0	T	T	0	0	T	T
RO-10 (e)	50	22.7	0	T	T	T	0	0	T	T	0	0	T	T
RO-11	40	18.1	0	T	T	T	0	0	T	T	0	0	T	T
RO-11	50	22.7	0	T	T	T	0	0	T	T	0	0	T	T
RO-12	40	18.1	0	0	T	T	0	0	T	T	0	0	S	0
RO-12	60	27.2	0	0	S	T	0	0	T	T	0	0	S	0
RO-13 (d)	40	18.1	0	T	T	T	0	0	T	T	0	0	T	T
RO-14	40	18.1	0	T	T	T	0	0	T	T	0	0	T	T
RO-15	40	18.1	0	0	S	T	0	0	T	T	0	0	T	T
RO-15 (c)	50	22.7	0	0	S	T	0	0	T	T	0	0	T	T
RO-16 (d)	40	18.1	0	0	S	T	0	0	T	T	0	0	T	T
RO-17	40	18.1	0	0	S	T	0	0	T	T	0	0	T	T
RO-17	55	25.0	0	0	T	T	0	0	T	T	0	0	T	T
RO-18 (d)	40	18.1	0	0	T	T	0	0	T	T	0	0	T	T
RO-18 (d)	60	27.2	0	0	T	T	0	0	T	T	0	0	T	T
RO-19	40	18.1	0	T	T	T	T	T	T	T	0	0	T	T
RO-20 (e)	40	18.1	0	T	T	T	0	0	T	T	0	0	T	T
RO-21	40	18.1	0	T	T	T	0	0	T	T	0	0	T	T
RO-22	40	18.1	0	0	T	T	0	0	T	T	0	0	T	T
RO-23 (b)	40	18.1	0	T	T	T	0	0	T	T	0	0	T	T
RO-24 (e)	40	18.1	0	T	T	T	0	0	T	T	0	0	T	T
RO-25 (b)	40	18.1	0	0	T	T	0	0	T	T	0	0	T	T
RO-26	40	18.1	0	T	T	T	0	0	T	T	0	0	T	T
RO-27 (b)	40	18.1	0	T	T	T	0	0	T	T	0	0	T	T
RO-28 (c)	40	18.1	0	T	T	T	0	0	T	T	0	0	T	T
RO-29 (c)	40	18.1	0	T	T	T	0	0	T	T	0	0	T	T

Table B-6. Continued

Specimen Number	Test Weight lb kg	One Wheel Impact						Two Wheel Impact									
		1.2 m/s (4 ft/s)			1.8 m/s (6 ft/s)			1.2 m/s (4 ft/s)			1.8 m/s (6 ft/s)						
		Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)				
RO-56	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RO-56	75	34.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RO-57	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RO-57	75	34.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RO-58	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RO-58	75	34.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RO-59	40	18.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RO-59	75	34.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*0 - Toy rolled over obstruction.

5 - Toy impacted obstruction and stopped without tipping over.

T - Toy impacted obstruction and tipped over.

(a) Toy is unstable when weight is applied.

(b) Toy collapsed under test weight.

(c) Structural or mechanical defect prevented testing.

(d) Toy design precludes performance of this test.

(e) Toy tips over in backward orientation due to incline of ramp. Test could not be conducted.

Table B-7. Results of Dynamic Stability Tests on Ride-In Toys, Forward Orientation

Specimen Number	Test Weight lb kg	One Wheel Impact						Two Wheel Impact							
		1.2 m/s (4 ft/s)			1.8 m/s (6 ft/s)			1.2 m/s (4 ft/s)			1.8 m/s (6 ft/s)				
		Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)		
RI-1	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-2	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-3	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-3	60	27.2	0	S	0	S	0	0	S	0	S	0	0	0	S
RI-4	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-4	50	22.7	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-5	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-5	50	22.7	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-6	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-6	60	27.2	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-7	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-7	60	27.2	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-8	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-8	75	34.0	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-9	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-9	60	27.2	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-10	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-10	60	27.2	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-11	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-11	50	22.7	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-12	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-12	75	34.0	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-13	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-13	75	34.0	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-14	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-14 (c)	55	29.5	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-15	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-15	75	34.0	0	0	0	0	0	0	0	0	0	0	0	0	0

* 0 - Toy rolled over obstruction.

S - Toy impacted obstruction and stopped.

T - Toy impacted obstruction and tipped over.

(c) Structural or mechanical defect prevented testing.

Table B-8. Results of Dynamic Stability Tests on Ride-In Toys, Backward Orientation

Specimen Number	Test Weight lb	One Wheel Impact						Two Wheel Impact						
		1.2 m/s (4 ft/s)			1.8 m/s (6 ft/s)			1.2 m/s (4 ft/s)			1.8 m/s (6 ft/s)			
		Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	
RI-1	40	0	0	0	0	T	0	0	0	T	0	0	0	T
RI-2	40	0	0	T	0	0	0	0	0	T	0	0	0	T
RI-3	40	0	T	T	0	T	0	0	0	T	0	0	0	T
RI-3	60	0	T	T	0	T	0	0	0	T	0	0	0	T
RI-4	40	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-4	50	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-5	40	0	0	S	0	0	0	0	0	S	0	0	0	0
RI-5	50	0	0	T	0	0	0	0	0	T	0	0	0	T
RI-6	40	0	0	S	0	0	0	0	0	S	0	0	0	0
RI-6	60	0	0	S	0	0	0	0	0	S	0	0	0	0
RI-7	40	0	0	T	0	0	0	0	0	T	0	0	0	T
RI-7	60	0	0	T	0	0	0	0	0	T	0	0	0	T
RI-8	40	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-8	75	0	0	S	0	0	0	0	0	S	0	0	0	0
RI-9	40	0	0	S	0	0	0	0	0	S	0	0	0	0
RI-9	60	0	0	S	0	0	0	0	0	S	0	0	0	0
RI-10	40	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-10	60	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-11	40	0	0	T	0	0	0	0	0	T	0	0	0	T
RI-11	50	0	0	T	0	0	0	0	0	T	0	0	0	T
RI-12	40	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-12	75	0	0	T	0	0	0	0	0	T	0	0	0	0
RI-13	40	0	0	S	0	0	0	0	0	S	0	0	0	0
RI-13	75	0	T	T	0	0	0	0	0	T	0	0	0	T
RI-14	40	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-14	75	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-15	40	0	0	0	0	0	0	0	0	0	0	0	0	0
RI-15	75	0	0	0	0	0	0	0	0	0	0	0	0	0

*0 - Toy rolled over obstruction.
 S - Toy impacted obstruction and stopped without tipping over.
 T - Toy impacted obstruction and tipped over.

(c) Structural or mechanical defect prevented testing.
 (e) Toy tips over in backward orientation due to incline of ramp. Test could not be conducted.

Table B-9. Results of Dynamic Stability Tests on Wagons with Front Wheels Straight, Forward Orientation

Specimen	Number	Test Weight lb	Test Weight kg	One Wheel Impact						Two Wheel Impact						
				1.2 m/s (4 ft/s)			1.8 m/s (6 ft/s)			1.2 m/s (4 ft/s)			1.8 m/s (6 ft/s)			
				Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.5 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	
W-1	40	18.1	0	0	S	0	0	0	0	0	S	0	0	0	0	0
W-1	50	22.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W-2	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W-2	55	25.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W-3	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W-3	60	27.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W-4	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W-4	75	34.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W-5 (d)	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W-5 (d)	50	22.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W-6	40	18.1	0	0	S	0	0	0	0	0	S	0	0	0	0	S
W-6	60	27.2	0	0	S	0	0	0	0	0	S	0	0	0	0	S
W-7	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W-7 (b)	75	34.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W-8	40	18.1	0	0	S	0	0	0	0	0	S	0	0	0	0	0
W-9 (b)	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W-10	40	18.1	0	0	S	0	0	0	0	0	0	0	0	0	0	0
W-10	75	34.0	0	0	S	0	0	0	0	0	0	0	0	0	0	0
W-11	40	18.1	0	0	S	0	0	0	0	0	S	0	0	0	0	T
W-11	50	22.7	0	0	T	0	0	0	0	0	T	0	0	0	0	T
W-12	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W-12	75	34.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W-13	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W-13	75	34.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W-14	40	18.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W-14	75	34.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*0 - Wagon rolled over obstruction.

S - Wagon impacted obstruction and stopped

T - Wagon impacted obstruction and tipped over.

(b) Toy collapsed under test weight.

(d) Toy design precludes performance of this test.

Table B-10. Results of Dynamic Stability Tests on Wagons with Front Wheels Straight, Backward Orientation

Specimen	Test Weight lb. kg	One Wheel Impact						Two Wheel Impact						
		1.2 m/s (4 ft/s)			1.8 m/s (6 ft/s)			1.2 m/s (4 ft/s)			1.8 m/s (6 ft/s)			
		Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	Obstruction Height 0.6 cm (0.25 in)	Obstruction Height 1.3 cm (0.5 in)	Obstruction Height 2.5 cm (1.0 in)	
W-1	40	0*	0	T	0	0	0	0	T	T	0	0	T	T
W-1	50	0	T	T	0	T	0	T	T	T	0	0	T	T
W-2	40	0	0	S	0	0	0	0	T	S	0	0	T	T
W-2	55	0	0	T	0	T	0	0	T	T	0	0	T	T
W-3	40	0	0	T	0	T	0	0	T	T	0	0	T	T
W-3 (e)	60	0	0	T	0	T	0	0	T	T	0	0	T	T
W-4	40	0	0	S	0	S	0	0	S	S	0	0	S	S
W-4	75	0	0	S	0	S	0	0	S	S	0	0	S	S
W-5	40	0	0	S	0	S	0	0	T	T	0	0	T	T
W-6 (e)	40	0	0	S	0	S	0	0	S	S	0	0	S	S
W-6 (e)	60	0	0	S	0	S	0	0	S	S	0	0	S	S
W-7	40	0	0	S	0	S	0	0	T	T	0	0	T	T
W-7 (b)	75	0	0	S	0	S	0	0	T	T	0	0	T	T
W-8	40	0	0	T	0	T	0	0	T	T	0	0	T	T
W-9 (b)	40	0	0	T	0	T	0	0	T	T	0	0	T	T
W-10	40	0	0	S	0	S	0	0	S	S	0	0	S	S
W-11	40	0	0	S	0	S	0	0	S	S	0	0	S	S
W-11	50	0	0	T	0	T	0	0	T	T	0	0	T	T
W-12	40	0	0	T	0	T	0	0	T	T	0	0	T	T
W-12	75	0	0	T	0	T	0	0	T	T	0	0	T	T
W-13	40	0	0	T	0	T	0	0	T	T	0	0	T	T
W-13	75	0	0	T	0	T	0	0	T	T	0	0	T	T
W-14	40	0	0	T	0	T	0	0	T	T	0	0	T	T
W-14	75	0	0	T	0	T	0	0	T	T	0	0	T	T

* O - Wagon rolled over obstruction.
 S - Wagon impacted obstruction and stopped without tipping over.
 T - Wagon impacted obstruction and tipped over.

(b) Toy collapsed under test weight.
 (e) Toy tips over in backward orientation due to incline of ramp. Test could not be conducted.

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<p>16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)</p> <p>Stability and abuse tests were conducted on 88 riding toys in order to provide information which can be utilized to set realistic abuse performance levels for riding toys, as well as characterize the types of stability hazards associated with this class of toys. The results of these tests are summarized in tabular form and a description of the discrepancies encountered as well as photographs of these discrepancies are presented.</p> <p>The appendices of this report contain photographs of each test specimen as well as the tabulated raw data for each test conducted.</p>			
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