

# NEWS from CPSC

## U.S. Consumer Product Safety Commission

Office of Information and Public Affairs

Washington, DC 20207

FOR IMMEDIATE RELEASE

March 12, 1998

Release # 98-080

Company Phone Number: (704) 963-6688

CPSC Consumer Hotline: (800) 638-2772

CPSC Media Contact: Ken Giles, (301) 504-7052

### CPSC, Misty Mountain Threadworks Inc. Announce Recall of Climbing Harness

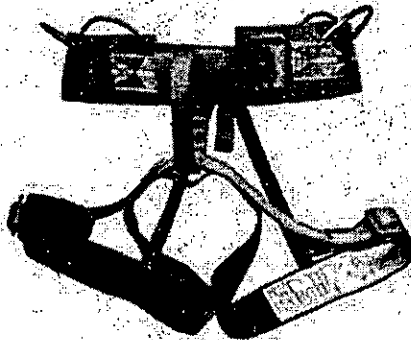
WASHINGTON, D.C. - In cooperation with the U.S. Consumer Product Safety Commission (CPSC), Misty Mountain Threadworks Inc. of Banner Elk, N.C., is recalling about 5,000 climbing harnesses with a front entry sleeve system. If attached incorrectly, the climber's swami belt can be held by only a small piece of elastic behind the sleeve. Climbers who don't realize this mistake create a dangerous situation where the belay/rappel loop tears through the elastic webbing, potentially causing the climber to flip backwards, possibly causing injury.

Misty Mountain Threadworks is aware of at least three incidents where climbers have ripped the elastic webbing, but there have been no injuries reported.

The front entry sleeve is used in four different harness styles by the company -- Arete, Finesse, Quantum and Cadillac Big Wall. All the harnesses have black nylon webbing with various additional color and design combination features. The tag on the harness reads, "Misty Mountain Threadworks." A label on the harness shows the manufacture date. The recalled harnesses were manufactured from August 1996 through September 1997. The harness comes in a blue box showing a photo of a mountain labeled Dhulagiri from Pun Hill, Nepal.

Outdoor and climbing shops, climbing gear catalogs and Misty Mountain Threadworks sold these harnesses from August 1996 through March 1998 for about \$42 to \$80, depending on the model.

Climbers who have a Misty Mountain Threadworks harness with a front entry sleeve should stop using the harness and immediately return it to Misty Mountain Threadworks. The harness will be repaired and returned promptly. Send your harness for repair to Misty Mountain Threadworks, 718 Burma Road, Banner Elk, NC 28604. For more information, call Misty Mountain Threadworks collect at (704) 963-6688 between 9 a.m. to 5 p.m. EST Monday through Friday. You may also contact them by electronic mail at [info@mistymountain.com](mailto:info@mistymountain.com).



[Send the link for this page to a friend!](http://www.cpsc.gov/cpsc/pub/prerel/prhtml98/98080.html) The U.S. Consumer Product Safety Commission is charged with protecting

the public from unreasonable risks of serious injury or death from more than 15,000 types of consumer products under the agency's jurisdiction. Deaths, injuries and property damage from consumer product incidents cost the nation more than \$700 billion annually. The CPSC is committed to protecting consumers and families from products that pose a fire, electrical, chemical, or mechanical hazard or can injure children. The CPSC's work to ensure the safety of consumer products - such as toys, cribs, power tools, cigarette lighters, and household chemicals - contributed significantly to the 30 percent decline in the rate of deaths and injuries associated with consumer products over the past 30 years.

To report a dangerous product or a product-related injury, call CPSC's hotline at (800) 638-2772 or CPSC's teletypewriter at (800) 638-8270, or visit CPSC's web site at [www.cpsc.gov/talk.html](http://www.cpsc.gov/talk.html). To join a CPSC email subscription list, please go to [www.cpsc.gov/cpsclist.asp](http://www.cpsc.gov/cpsclist.asp). Consumers can obtain this release and recall information at CPSC's Web site at [www.cpsc.gov](http://www.cpsc.gov).



U.S. CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

**ADMMENDED SAFETY NOTICE [from June 9, 1992]**

**ATTENTION STATE AMUSEMENT RIDE SAFETY OFFICIALS**  
**Allan Herschell "SKYFIGHTER" AMUSEMENT RIDE INSPECTION**  
**AUGUST 2<sup>nd</sup> 2000**

On June 9, 1992, the United States Consumer Product Safety Commission (CPSC) distributed an amendment to an April 2, 1992 safety notice concerning the Allan Herschell "Skyfighter" children's amusement ride. The ride's stabilizing arms/tension rod may experience metal fatigue and shear off at the threaded ends. The attached tubs will fall to the ground and possibly result in serious injury to a rider.

The amendment to the original notice provided for the verification of the use of the proper-sized 3/4-inch diameter stabilizing rods and the inspection by you of known "Skyfighters" in your state. We have recently received a request for clarification of this ride's inspection requirements. The ride's inspection is to assure that rods that are worn, cracked, or suffering from metal fatigue cracking are not used. It is recommended that the "Skyfighter" inspection include a daily visual and annual nondestructive inspection of the stabilizing rods of the "Skyfighter." The annual nondestructive inspection shall use dye-penetrant inspection or magnetic-particle inspection after appropriate preparation by qualified personnel to locate open-to-the-surface cracks that may be overlooked with unaided-eye visual techniques. The annual nondestructive inspection should be done by personnel qualified in the method used. Any cracked rods should be replaced immediately.

Continue verifying that the proper-sized stabilizing rods are utilized with the "Skyfighter" and assure that the rods are not worn or cracked. All connections, sweeps, and areas prone to fatigue should be inspected and parts replaced as necessary.

If you have any questions, please contact:

J. A. DeMarco  
Office of Compliance  
U.S. Consumer Product Safety Commission,  
Washington, D.C. 20207,  
Telephone: (301) 504-0603 x 1353,  
FAX at (301) 504-0539.

Attached drawing

a:\skyfigtrevised080200/jxd



CPSA 6 (b)(7) Closed  
4/22/01  
No Mfrs/Prvtlbrs or  
Products Identified  
Excepted by \_\_\_\_\_  
Firms Notified, \_\_\_\_\_  
Comments Processed.

U.S. CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, D.C. 20207-0001

**TO: ALL AMUSEMENT RIDE SAFETY OFFICIALS**  
**IMPORTANT**  
**AMUSEMENT RIDE SAFETY BULLETIN!**  
**RE: Inflatable Amusement Rides**  
**Issued May 23, 2001**  
**[Revised/Re-issued 12/5/2001]**

The U.S. Consumer Product Safety Commission (CPSC), in cooperation with the states of Florida, Wisconsin, California and the Commonwealth of Kentucky has investigated several incidents nationally which involved inflatable amusement rides. The incidents occurred between March 1999 and February 2001 and involved broken bones, head injuries, contusions, abrasions and sprains. Additionally, the Commission is aware of 3 deaths in previous years, involving inflatable rides. These mobile inflatable rides are customarily used at fairs, carnivals and festivals, but are also operated at private fairs and parties through rental agencies. Riders on inflatables vary in age from children to adult.

The Commission is aware of 9 incidents, which resulted in 21 injuries, on large slide-type inflatables and 33 incidents, which resulted in 33 injuries, with bounce-type inflatables. These incidents were primarily attributable to improper operation, anchoring and set-up. Due to the number of injuries and incidents involving inflatable rides and to reduce the number of injuries through a more consistent industry-wide operation of all inflatable amusement rides, the Commission staff is issuing this Safety Bulletin.

The "Hazard Alert", dated March 14, 2001 from the South Australian Department of Administrative and Information Services addresses operation, set-up and safety related aspects of Inflatable Amusement Structures. We request all owners, operators, state safety officials and those firms that rent inflatables to private parties, to closely follow manufacturers' instructions and guidelines for operation and set-up. In addition, the following recommendations should be adhered to:

*Inspection procedures and guidelines for safe set-up and operation of inflatable rides may vary from ride to ride or from manufacturer to manufacturer, please follow manufacturer's requirements. The CPSC staff recommends the following additional guidance:*

- Minimum number of operators on a large inflatable slide is two (2), for slides over 15 feet tall.
- Minimum number of operators on an inflatable bounce or small slide, under 15 feet, is one (1).
- Maximum recommended weight per passenger is 200 lbs; or per manufacturer's recommendation.
- DO NOT exceed manufacturer's requirements for maximum loads for individual rides.
- Follow the owner/operator's manual for site layout, inflation procedures, ropes, tethers, tie-downs, anchors, use temperature range, maximum number of riders, size of riders, electrical codes, daily operation, daily inspection, washing, repair, deflation, drying, storage, and transportation.

- ALWAYS anchor rides per manufacturer's requirements and instructions.
- The on-ground anchor weight used for various inflatable ride range from 75-pounds (for bounce-type rides) to 500-pounds (for slide-type rides) for each recommended anchor position. This weight range strongly indicates that an inflatable ride's operator should follow the ride manufacturer's recommendations for proper anchoring and placement or certain type stakes.
- Place and use anchors at all of the manufacturer's required positions, at all times, for both indoor and outdoor use. These anchors can be straight stakes, screw stakes, ground weights or sandbag ground anchors. Straight stakes to be used range from 30 inches to 42 inches in length with at least 75% or more of the length in the ground (this length will be dependent on surface where set up). The ends of the stakes should be covered to prevent a tripping hazard.
- Anchor ropes, tethers, or tie-downs should be attached to a secure device or permanent structure and attached so that they cannot slip off the top of their stake during use. DO NOT attach anchors to motor vehicles.
- Ropes, tethers, and tie-downs should be sufficiently strong to resist breakage during use. CPSC staff recommends that the buyer purchase  $\frac{1}{2}$  inch diameter solid-braided polypropylene rope with a minimum tensile strength of 3700 lbs. tensile strength or 370 lbs. safe working load and follow manufacturer's requirements; whichever is greater.
- Identify and use the number and location of tie-downs specified by the manufacturer. DO NOT use non-load bearing positioning loops as tie-downs or anchor points.
- Do not use the inflatable ride above windspeeds that exceed the manufacturer's recommendation. Various manufacturers recommend maximum windspeeds from 15 to 25 mph depending on the ride. However, unload and deflate any inflatable ride when the wind speed exceeds 25 mph.
- Manufacturers and operators should consider that the inflatable ride should not collapse onto the riders if the power to the blower(s) inflating the ride should unexpectedly fail. Inflatable rides need a sealed chamber to prevent the rapid collapse of ceilings and walls onto the riders if the electric power to the blower(s) fails. Inflatable slides over 15 feet tall should not deflate and collapse, so that they dump riders to the ground.

*In addition, we recommend that state inspectors provide this bulletin on inflatable rides to rental companies within their state and that rental companies provide renters with the following materials:*

1. A training program for the renter for the proper operation of the inflatable ride.
2. A copy of the operation manual (and/or videos, training manuals) for each rental period.
3. A copy of this Safety Bulletin.
4. A release statement signed by the renter documenting that he has received and understands the ride operating procedures.

We request all state and local amusement ride safety inspectors, insurance inspectors and private contract inspectors, as well as owners and operators of "Inflatable Amusement Rides" to follow and adhere to the above guidance during inspection.

For further information contact:

J. A. DeMarco, Senior Compliance Officer  
 Office of Compliance  
 U.S. Consumer Product Safety Commission  
 (301) 504-0608 x1353  
 FAX (301) 504-0359 & email: [jdemarco@cpsc.gov](mailto:jdemarco@cpsc.gov)

[revised 11/30/01]



U.S. CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, D.C. 20207-0001

**TO: ALL AMUSEMENT RIDE SAFETY OFFICIALS**  
**IMPORTANT**  
**AMUSEMENT RIDE SAFETY BULLETIN!**  
**RE: Mobile Rock Walls & Climbing Walls**

Issued August 4, 2003

To prevent injury and death, the U.S. Consumer Product Safety Commission (CPSC) requests all owners, operators, state safety officials and those firms that rent climbing walls to private parties, to closely inspect the climbing walls and all equipment in accordance with manufacturers' instructions and guidelines for operation, repair, maintenance and set-up.

The Commission, with the support of the University of Missouri Police and the Missouri State Fire Marshals Office, investigated a tragic incident that occurred in Columbia, MO on July 14, 2003. A 22 year old female died while climbing a mobile rock wall when the auto-belay cable attached to her harness broke. The victim fell to the concrete below. The cable in the area of the break was covered by a black rubber sheath, and there was duct tape wrapped around the cable. The broken cable was corroded and frayed under the rubber sheath where it was not visible during normal operation. The other two cables of this three-climber also showed significant signs of wear.

Mobile climbing walls are customarily used at fairs, carnivals, festivals, sporting events, and promotional events. The mobile climbing walls can also be operated at private fairs and parties through rental agencies. Users of rock walls or climbing walls vary in age from children to adults. There are about 1,000 units of varied sizes (3, 4, and 5 climbers) of mobile rock walls and climbing walls operational in the U.S., according to industry estimates.

The three major manufacturers of rock/climbing wall mobile amusements (Extreme Engineering, Newcastle, CA; Spectrum Sports, Logan, UT; and Vertical Reality, Miami, FL) are cooperatively working with CPSC staff to alert operators and safety officials of the need to inspect and properly maintain the equipment to prevent further incidents.

*Inspection procedures and guidelines for safe set-up and operation of 'rock walls and climbing walls' may vary from ride to ride, state to state or from manufacturer to manufacturer. It is critical that you follow manufacturer's requirements. The CPSC staff provides the following additional guidance:*

Examine auto-belay cables, especially near pulleys, for wear, broken wires, 'fish hooks' (burrs/broken strands of wire cable), and deformation.

- Lift or slide the plastic or rubber sheath over the auto-belay cable on the patron/harness end and examine for wear, corrosion, broken wires, 'fish-hooks', etc. Replace cables if any are worn, corroded, have broken wires or 'fish-hooks'.
- Follow the owner/operator's manual regarding repair, maintenance and parts replacement.
- Inspect daily the auto-belay cables for 'fish-hooks', wear, and corrosion; replace annually or after 10,000 documented cycles, or earlier if necessary.
- Examine carabiners, swivels and rings for proper functioning and locking, and replace those not functioning properly.
- Examine harnesses for wear and tearing and replace if necessary.
- Maximum recommended weight per passenger is 250lbs, or per manufacturer's recommendation.
- Make sure the required number of operators is present on 3, 4, and 5 climber walls.
- DO NOT exceed manufacturer's requirements for maximum loads for individual walls.

*In addition, we recommend that state inspectors provide this bulletin to rental companies within their state and to owners and operators of these rides.*

We urge all state and local amusement ride safety inspectors, insurance inspectors and private contract inspectors, as well as owners and operators of "Rock Walls or Climbing Walls" to follow and adhere to the above guidance during inspection. Please contact manufacturers if you have further questions regarding



inspection details or parts replacement. Please inform CPSC if you encounter particular safety problems.

For further information contact:

J. A. DeMarco, Senior Compliance Officer  
Office of Compliance  
U.S. Consumer Product Safety Commission  
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e-mail: [jdemarco@cpsc.gov](mailto:jdemarco@cpsc.gov)



U.S. CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

Alan H. Schoem  
Director  
Office of Compliance

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January 2004

Manufacturers and Importers of Consumer or Home-use Inflatable Children's Toys

Home-use inflatable children's toys that contain electric motors powered by electric current from nominal 120-volt branch circuits are subject to the regulations for Electrically Operated Toys or Other Electrically Operated Articles Intended for Use by Children, 16 C.F.R. Part 1505. We have determined that this regulation applies to such products as they are designed, labeled, advertised, or otherwise intended for use by children, are electrically operated, and powered by a 120-volt circuit. However, as discussed below, we are exercising enforcement discretion so long as these products meet certain requirements.

Because electric motors associated with home-use inflatables are within easy access to young children, they may present an electrocution hazard to children. One cannot separate the motor/blower from an inflatable product, as it is integral to the function of the product. Children are clearly exposed to both the inflatable product and the motor/blower because the latter is affixed to the product by various means, usually by a sleeve, to provide the air to sustain the inflatable. Even though an adult would be needed to set up the inflatable and initially carry and position the motor/blower, children would be exposed to it because of the proximity of the motor/blower to the inflatable product. The motor/blower of this product is integral to the function of this toy and is not separated from the inflatable during operation. Because the motor/blower is part of the inflatable, we consider the total product to be intended to be used by children and subject to the electrical toy regulation.

The staff, in its enforcement discretion, will not enforce all the provisions of 16 C.F.R. Part 1505 for these products if they meet an appropriate electrical standard for outdoor use products, contain a listed Ground-Fault Circuit-Interrupter, GFCI, protected power cord, and a warning not to use extension cords.

The following provisions will not be enforced:

The standard limits the amperage to 5.5 amperes, 16 C.F.R. 1505.5(e). To use these products safely, the motors need to be powered with higher amperage than permitted in the standard to inflate and sustain the air pressure in the various types of units. We will allow higher amperage necessary to power the product.

The standard requires that the power cord length be from 5 to 10 feet, 16 C.F.R. 1505.5(e)(5). Short cord length will encourage the use of extension cords. Therefore, we

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will allow the use of longer cords than allowed in the regulation so long as the cords are protected by a GFCI.

The standard does not have a provision for exposing the electric motor to wet conditions that are encountered in outdoor situations. Also, the standard does not require the use of a GFCI. There are no restrictions on the use of extension cords which can be hazardous if used outdoors in wet conditions. For us to exercise enforcement discretion, the electrical standard to which these products are certified must include a leakage current test, dielectric tests, locked rotor tests, and rain spray tests followed by additional leakage current and dielectric tests. In this regard, we will exercise enforcement discretion if the electric motors sold with these inflatables are certified to meet UL 507, *Standard for Safety for Electric Fans*, or another appropriate outdoor electrical standard, and listed for this specific outdoor application.

These products must meet the labeling provisions found at 16 C.F.R. § 1505.3 for the product, packaging, and instructions. Also, these products must comply with the provision for accessibility under 1505.4 (f)(2)(i) to ensure that the fasteners on the motor cannot be removed by a common household tool to access live electrical parts. Any access to live electrical parts must be prevented by welding, or the use of tamper-proof screws or equivalent. The attachment-plug must meet the requirements at 16 C.F.R. § 1505.5(e)(3)&(4). The firms that market these inflatables must meet the record keeping requirements at 16 C.F.R. § 1505.4(a)(3).

Firms should add a warning to instructions for these products that sudden gusts of wind may lift the inflatables off the ground. In addition, firms should include appropriate means for anchoring, such as, stakes with the products and provide instructions so that the user will secure the loops on the inflatables to the ground to prevent them from moving or turning over due to wind gusts. Failure to do so could result in the staff making a preliminary determination that the products are defective and present a substantial risk of injury to consumers.

In addition, the firms should add the following or equivalent warning, on the motor or on the electrical cord itself, which states:

**⚠ WARNING- Electrocution Hazard  
DO NOT USE EXTENSION CORDS  
WITH THIS PRODUCT."**

The warning should be in accordance with the American National Standards Institute, ANSI, standard Z535.4-2002 for *Product Safety Signs and Labels*. The warnings to secure the inflatable and not to use extension cords also should be prominently displayed and placed in bold print in the instructions.

All firms have a continuing obligation to inform the Commission if they obtain information that reasonably supports the conclusion that the inflatable products contain a defect which could create a substantial product hazard or creates an unreasonable risk of serious injury or death. See 16 C.F.R. Part 1115 and CPSC's Recall Handbook. You can access these materials on our Web site at [www.cpsc.gov](http://www.cpsc.gov). Click on search and then enter "1115" for 16 C.F.R. Part 1115 or enter "recall handbook" for the handbook. The Commission's regulations

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are also located on this Web site and can be accessed at the "Business" icon and search under regulations.

This interpretation is based on the information currently available to the staff. If additional facts come to our attention, the interpretation could change. Also, the views expressed in this letter could be superseded by the Commission.

If you seek assistance or if you have any questions, please contact Frank Krivda, Senior Compliance Officer, at (301) 504-7580 or by e-mail at [fkrivda@cpsc.gov](mailto:fkrivda@cpsc.gov) or write to: Office of Compliance, U.S. Consumer Product Safety Commission, Room 613A, 4330 East West Highway, Bethesda, MD 20814-4408.

Sincerely,

/s/

Alan H. Schoem



**NO. 31 SAFE OPERATION OF INFLATABLE AMUSEMENT STRUCTURES**

**DATE: 14 March 2001**

**1. OBJECTIVE:**

The purpose of this Alert is to inform Amusement Ride owners and operators about the need to erect and operate inflatable amusement structures in a safe manner.

**2. BACKGROUND:**

Workplace Services is currently investigating an accident involving an inflatable amusement structure (jumping castle) at a country race meeting north of Adelaide. The jumping castle was erected and operating on an apparently fine day when it is reported that a strong gust of wind lifted the jumping castle, releasing or breaking the restraining ropes. Twelve children were injured in the incident, one fatally.

Similar incidents have been reported in other parts of Australia and overseas, including Tasmania, where a jumping castle's restraining ropes slipped off the anchoring pegs, injuring a mother and two children.

**3. PREVENTATIVE MEASURES:**

Due to these incidents, the following recommendations are emphasised:

- A thorough check of the inflatable structure and its accessories shall be carried out before use. This includes checking that all anchor points, anchor ropes and anchor stakes or ballast are undamaged and fit for continual use,
- Each device shall be held down in accordance with the manufacturer's recommendations, with the following requirements, as taken from AS 3533, as a minimum standard:
  - On grass or unpaved areas, pegs shall be used at every anchorage point and shall be driven at least 300mm into the ground. Heavy pegs (at least 25-30mm in leg size) shall be used on at least half of these anchorage points. Consideration should be given to using anchoring pegs with a restraining hook or collar at the top to prevent the attached ropes sliding up and being released. The tripping hazard

introduced by this system of anchoring should also be addressed.

- Where inflatable structures are used on paved surfaces, they shall be anchored by tying to a secure, preferably permanent, structure. In the absence of such structures, an adequate ballast system shall be used, with the minimum requirement being eight concrete or similar blocks with a mass of at least 50 kg each.
- All tie-down ropes attached to the device shall be fastened to a peg or anchorage. Any ropes that become detached shall be replaced with ropes of at least equivalent breaking strength and attached with the same or better attachment strength.
- Each inflatable structure, while operating, shall be under the supervision of a person at least 18 years of age, who is fully trained in all aspects of its safe operation. As well as monitoring the holding down requirements and weather conditions, this person shall also ensure that an appropriate mix of persons use the device and that children are not in danger of injury from adults using the device at the same time
- The operator should monitor prevailing wind conditions and cease operation when the wind velocity approaches the maximum recommended by the manufacturer. The structure shall not be used in wind speeds greater than 45 km/h. The device should be cleared and deflated immediately when the wind speed approaches this figure.

For more detailed information about the operation of inflatable amusement structures, refer to Australian Standard 3533 – 1997 Amusement Rides and Devices.

**4. FURTHER INFORMATION:**

For further information in relation to the contents of this Alert, please contact:

Department for Administrative and Information Services  
**Workplace Services**  
Construction, Utilities and Telecommunications Team  
GPO Box 465, ADELAIDE SA 5001  
Ph: 1300 365 255  
Mobile and Interstate callers Ph: (08) 6303 0400  
Website: <http://www.eric.sa.gov.au>

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UNITED STATES GOVERNMENT

MEMORANDUM

U.S. CONSUMER PRODUCT  
SAFETY COMMISSION  
WASHINGTON, D.C. 20207

JUL 13 1994

TO : Jay DeMarco, Compliance Officer, CECA

FROM : Suad Nakamura, Ph.D., HSPS, 504-0477 x-1202

SUBJECT : PSA No. 9347, CA930086, Trailcraft/Spaceball  
International "spaceball" Amusement Ride.

REQUEST: The Office of Corrective Actions has requested that Health Sciences review the firm's report and comment on the "fix" proposed by Tailcraft Manufacturing. Linear acceleration and

DISCUSSION: The gravitational force on the body is the vector sum of forces exerted by acceleration and the normal gravitation pull. The physiological effects of gravity (G-force) on the human body varies with body height and orientation. In rotary acceleration (angular velocity) the angle of rotation and the position of the rotational axis (center of rotation) with respect to the body also play a very important role. The Center of rotation within the body determines the nature of the injury (Parker, 1973). Gravitational forces affect the hydrostatic pressure (fluid pressure) in blood vessels, and fluid containing spaces. When the G-forces are positive that is in the head-to-foot direction the amount of blood going to the head is decreased, thus decreasing blood flow to the eyes and brain. When the pressure in the eye decreases to 16-20mm Hg, (this pressure is reached when the G values are between 3.5-4 G) vision is impaired, this is known as "grayout". When the values of G's exceed 4 there is a total loss of vision, temporary blindness or black-out due to insufficient blood supply to the retina, (Ray, 1974). Negative G-forces affect the body in the opposite direction that is from foot-to-head. In an inverted position the effect of gravity is reversed. Negative pressure results in an increase in arterial pressure of the head. Blood flow to the head region increases resulting in congestion of all vessels of the upper parts of the body. Visual sensation known as "redout" occurs. Congestion in blood vessels may result in blood vessel rupture. Conjunctive hemorrhage during rotation occurs in humans at 60-rpm for as short as, a 40 sec. period (Weiss, et al., 1954). Gravity also shifts body organs that are attached to the body by flexible tissue (mobile organs). Acceleration and change in orientation effect balance.

Conclusion: According to the Engineering Sciences PSA 9346, (T. Caton, 1994) the proposed speed 40-rpm recommended by the manufacturer will not produce g-forces in excess of 2 Gs. Thus

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the 40-rpm 60 sec. rides are not likely to inflict irreversible damage. However, a ride of this speed may produce injury to individuals with predisposed circulatory, or vision problems. Individuals at risk are: pregnant women, patients with high blood pressure, heart conditions, and weak blood vessels, also individuals with back, neck, and ear, problems, diabetics and individuals with equilibrium problems or who experience motion sickness. When the "spaceball" ride exceeds 50-rpms the potential for generating G-forces in excess of 3 G's is possible. Such forces are likely to produce eye injuries.

References:

1. Bioastronautics Data Book, Second Edition, Edited by James F. Parker, Jr. and Vita West, NASA SP-3006, Washington, DC: National Aeronautics and Space Administration, 1973.
2. Medical Engineering, Charles Ray, Edit., Year Book Medical Publishers, 1974.
3. Weiss, H.S., Edelberg R., Charland P.V, & Rosenbaum, J.I. The physiology of simple tumbling (part 2) Human studies WADC-TR-53-139 Wright-Patterson Air Force Base, Ohio, 1954.

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Table 1 - Estimation of g Forces on a Spaceball Rider

Ride Speed (rpm)	Estimated Acceleration (g) For Persons 5 ft 4 inch Tall and 5 ft 10 inch Tall	
10	0.04	0.05
20	0.16	0.20
30	0.36	0.46
40	0.65	0.82
50	1.02	1.28
60	1.47	1.84
70	2.01	2.50
80	2.63	3.28

The calculations assume a head-over-heels spin only. The effect of earth's gravity is added (+ 1 g) as a rider is rising during the head-over-heels spin. The radius is estimated as the distance between the hips and eyes of a person seated in a Spaceball. Data provided by Trailcraft indicates that the radius for a person 5 ft 4 inches tall would be 14½ inches and the radius for a person 5 ft 10 inches tall would be 18 inches.

The formula used for acceleration was:  $a = \omega^2 r$

where a = acceleration

$\omega$  = angular speed

r = radius (distance hips to eyes)

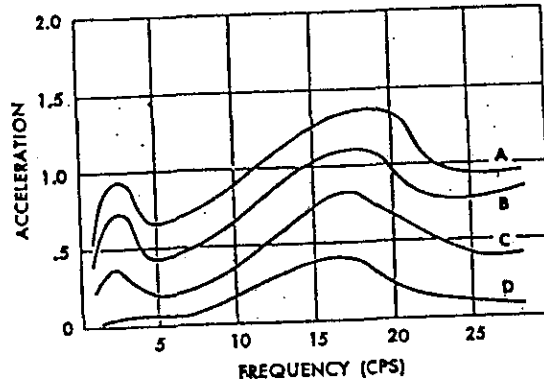
57.3° = 1 radian

32 ft/sec<sup>2</sup> = acceleration due to gravity

## VIBRATION • ACCELERATION

Reaction to sinusoidal, whole body vibration in the vertical axis (taken on a hard seat with subject restrained by seat belt) is shown in the graph at right (after Parks<sup>29</sup>).

- A = alarming
- B = extremely annoying
- C = mildly annoying
- D = definitely perceptible



## G-FORCES

The term g-force is applied to the acceleration due to gravity. A body stationary to the earth is subjected to a downward pull which is equivalent to a linear acceleration of one g.

### EFFECTS OF PROLONGED G

- 
- 2 g — visual acuity is reduced
  - 4 g — gross body movement is difficult
  - 8 g — respiration becomes difficult
  - 10 g — difficult to hold head up, can't move limbs
  - 12 g — breathing difficult without mechanical help
  - 14 g — vision begins to fail
- 

- 2 g — visual acuity reduced
  - 4 g — peripheral blindness, limb movement difficult
  - 5 g — temporary blindness and loss of body control
  - 6 g — unconsciousness
- 

- 2 g — diminished vision, + head pains
  - 3 g — conjunctival hemorrhage, red-out, and mental confusion
  - 4 g — probable hemorrhage and retinal bleeding
- 



### TOLERANCE LIMITS

- 5 negative g for 0.5 second
- 5 positive g for 20 seconds
- 10 negative g for 0.01 second
- 10 positive g for 2 seconds
- 20 positive g for 0.15 second

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United States  
CONSUMER PRODUCT SAFETY COMMISSION  
Washington, D.C. 20207

MEMORANDUM

DATE: July 8, 1994

TO : J. A. DeMarco, CECA  
Through: Marc Schoem, Director, EXCE  
James F. Hoebel, Acting Director, ESME  
FROM : Thomas E. Caton, ESME *Thomas E. Caton*  
SUBJECT: Addendum to PSA 9346, CA930086, Trailcraft/Spaceball  
International "Spaceball" Amusement Ride  
REF : (a) ES Memorandum; PSA 9346, CA930086,  
Trailcraft/Spaceball International "Spaceball"  
Amusement Ride, dated 23 June 1994  
(b) HS Memorandum; PSA 9342, CA930086,  
Trailcraft/Spaceball International "Spaceball"  
Amusement Ride, in preparation  
(c) FAX from Mr. Barry Reid, Trailcraft to Mr. James  
DeMarco, CECA, dated 27 June 1994

DISCUSSION

Reference (a) concluded that a rpm counter and buzzer device installed on new and existing Spaceball amusement rides should help an operator to run the ride according to the manufacturer's recommendations. Reference (a) also reported that Trailcraft, the Spaceball's new manufacturer, recommends a top speed of 40 rpm for a 60 second Spaceball ride. Mr. Barry Reid of Trailcraft says that the ride is still safe at 50 rpm, but that it goes into an undesirable flat spin ride mode.

HS is preparing a memorandum about hazards involving the Spaceball [Reference (b)]. On 27 June 1994, CECA received a FAX [Reference (c)] which discussed the g forces generated by the Spaceball's corkscrew spin on a rider. Reference (c) did not estimate the g forces generated by a head-over-heels spin in a Spaceball. ES believes that the head-over-heels spin is more relevant. ES calculated the g forces for a head-over-heels spin using the body dimensions provided by Trailcraft [Reference (c)]. These calculated g forces are presented in Table 1, and were provided to HS. HS reported [Reference (b)] that the human eye is subject to conjunctival hemorrhage and red out when subjected to accelerations exceeding 3 g. As a rider is spinning head-over-heels in a Spaceball, the effect of gravity would be additive on the rider. Based on the values presented in Table 1, a 5 ft 10 inch tall rider may experience during a head-over-heels