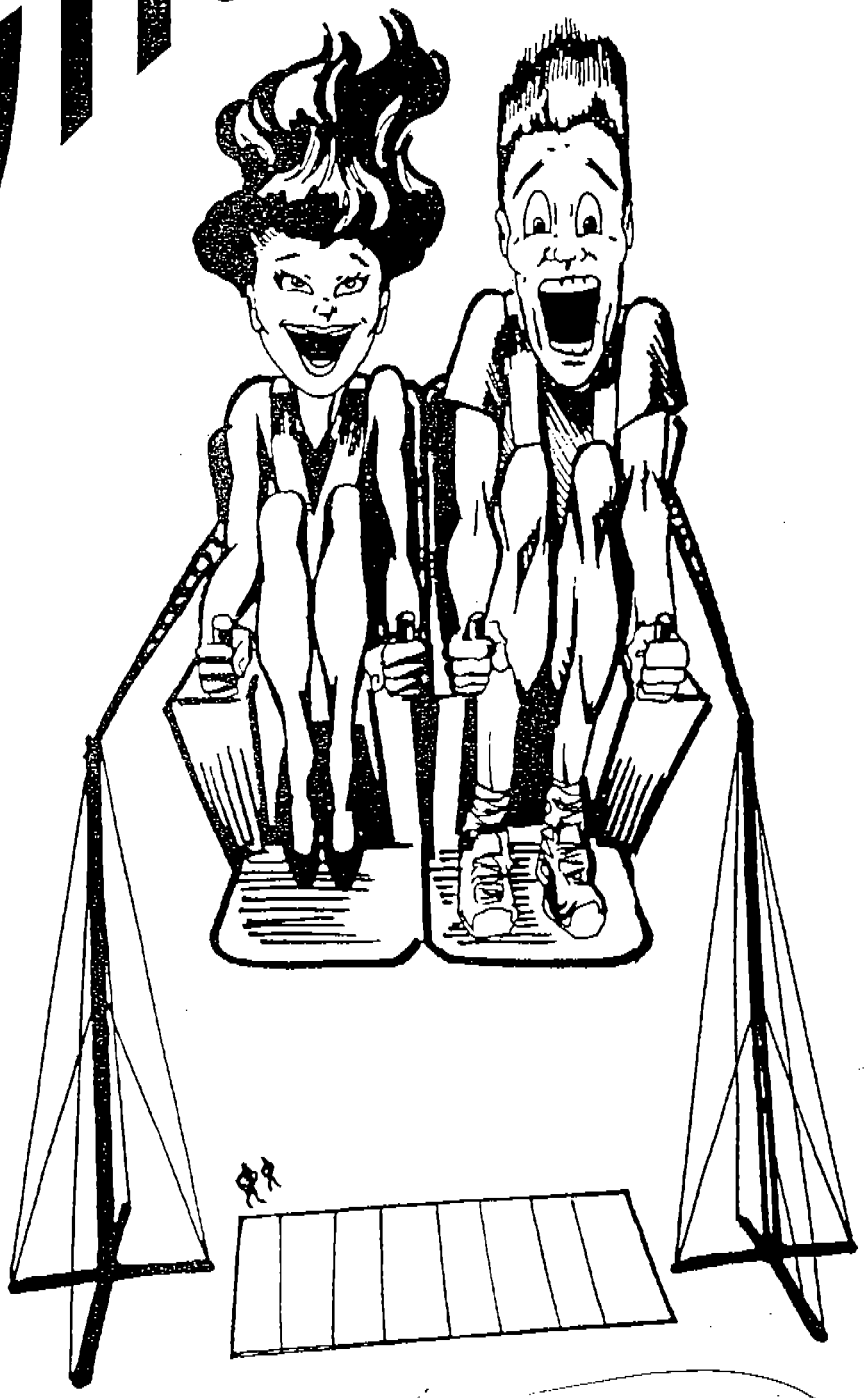
The EJECTION SEAT!

MFG: Bungee ADVENTURE
RIDE: Ejection SEAT



™

Designed and manufactured by Bungee Adventures

Copy to Murray
Orig in BF file

ADVENTURES

Ejection Seat Safety Bulletin
#1

To: All Ejection Seat Owners And Operators

From: Bungee Adventures

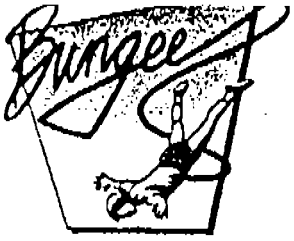
Date: March 28, 1994

Subject: Safety pins falling out of Elastic Ejection Element connection points

It has come to our attention that the safety pins that retain the nuts on the bolts that attach the two ends of the elastic ejection elements have been falling out during launches. Due to the two hex jamb nuts that have been supplied with replacement 3/4 inch bolts, no incidents have occurred that have endangered participants.

We are now requiring that all safety pins that have been previously used at this connection be removed and replaced with the more permanent cotter pin. The two ends of the cotter pin shall be bent around the bolt tightly to prevent the ejection element from snagging the pin. These cotter pins shall be used no more than 2 times before they shall be replaced with new cotter pins. Additionally, the two hex jamb nuts on each bolt shall be tightened against each other using two wrenches prior to placing the cotter pin in.

This bulletin supersedes the Operation and Maintenance Manual Rev: 01-14-94. Any questions can be directed to Peter Kockelman.



March 28, 1994

To Whom It May Concern:

Due to the changes in manufacturing of Elastic Ejection Elements at Bungee Adventures, we feel that the life of the Ejection Elements that Infinite Adventures is using can tentatively be raised to no more than 500 launches. Bungee Adventures, Infinite Adventures, and Stat Cochron our Safety Consultant will evaluate the data regarding increasing the jump life on all of Bungee Adventures Elastic Ejection Elements to 500 launches before changing the Operations and Maintenance Manual.

Infinite Adventures will still follow the inspection procedures set forth in the Maintenance section of the Operations Manual. If any of the 5 conditions for early cord retirement are met or present then the two cords must be replaced as a set.

These cords shall only be used during the daylight hours and shall be completely lowered every 10 launches after reaching 400 launches and inspected from end to end for broken strands.

When the cords are retired, the total number of launches on that set shall be recorded and the two cords shall be returned to Bungee Adventures with a copy of the cord logs. Bungee Adventures will evaluate the data and inspect the cords. Infinite Adventures will continue testing the cords in this fashion until Bungee Adventures amends the Operations Manual or rescinds this authorization.

This letter grants only Infinite Adventures the right to use their Elastic Ejection Elements past 400 launches.

Any questions regarding this matter should be directed to Peter Kockelman at Bungee Adventures.

Peter Kockelman

Peter Kockelman, President

cc. Stat Cochron
Infinite Adventures

2218 OLD MIDDLEFIELD WAY #Q • MTN. VIEW, CA 94043 • (415) 903-3548 FAX (415) 903-3550

ADDENDUM
The Ejection Seat Amusement Ride

Boom Failure:

In the event the release boom fails in any manner, thus rendering it inoperational, the Ejection Seat may still be operated via manual release consisting of a pull rope or cord, R.A.M. hook, and steel anchoring cable. Typically, the R.A.M. hook and steel anchoring cables are components borrowed from the release boom to accomplish this form of release, provided these components are in good working order. This is an acceptable method of release and was used repeatedly during the prototypical stage. This method is a short term bypass of the release boom, and should not be used for more than two (2) weeks.

Cedar Beech Ltd.

• RR 7 • Calgary, Alberta, Canada • T2P 2G7

PARAMETERS FOR USE OF EJECTION SEAT CORDS MANUFACTURED BY CEDAR BEECH LIMITED

- All cords should by stored out of direct sunlight and in a cool place.
- Cords should be suspended without baring weight when stored for lengthy periods of time.
- Each set of new cords should be pre-stretched (without releasing the seat) 2 times up and 2 times down prior to use.
- After 500 launches the operators must complete a thorough visual inspection of the cords after every 10 launches. Each visual check should be manually recorded until cords are retired.
- Each Ejection Seat cord set must be retired after 600 launches.

Your Truly,

Jocey Runquist, B.A , Dip.Sc.
Owner

Infinite Adventures Ejection Seat EEE Usage Log

Ride # 120002 Model# 10,000

Elastic Ejection Element Serial #________________ & ________________
Date of Rubber Mfg. ____________
Mfg. Lot # ________________
Date of Cord Mfg. ____________
Event used at ______________

DATE	INSPECTED BY	LAUNCHES TODAY
HOURS OF OPERATION ________ to ________		TOTAL LAUNCHES
DATE	INSPECTED BY	LAUNCHES TODAY
HOURS OF OPERATION ________ to ________		TOTAL LAUNCHES
DATE	INSPECTED BY	LAUNCHES TODAY
HOURS OF OPERATION ________ to ________		TOTAL LAUNCHES
DATE	INSPECTED BY	LAUNCHES TODAY
HOURS OF OPERATION ________ to ________		TOTAL LAUNCHES
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HOURS OF OPERATION ________ to ________		TOTAL LAUNCHES
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HOURS OF OPERATION ________ to ________		TOTAL LAUNCHES
DATE	INSPECTED BY	LAUNCHES TODAY
HOURS OF OPERATION ________ to ________		TOTAL LAUNCHES
DATE	INSPECTED BY	LAUNCHES TODAY
HOURS OF OPERATION ________ to ________		TOTAL LAUNCHES

Comments ____

STATE OF FLORIDA
DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES
904/488-9790 (Office) 904/488-9023 (Fax) 800/544-8862 (Emergency Only)
FAIR RIDES INSPECTION

DAILY INSPECTION FORM

SECTION 616.242 F.S.

OWNER INFINITE ADVENTURES INC DATE _____

AMUSEMENT COMPANY SAME LOCATION/EVENT _____

DEVICE NAME EJECTION SEAT USAID # 03311

Code: (S) Satisfactory (X) Unsatisfactory (N) Does not Apply
(⊗) MUST CIRCLE AND INITIAL ANYTHING MARKED UNSATISFACTORY WHEN CORRECTED

	CODE	COMMENTS		CODE	COMMENTS
STRUCTURAL			ELECTRICAL		
Welds			Ground		
Cables/Clamps			Electric Boxes		
Structure/Sweeps			Lights		
Pins/Bolts/Nuts			Cables		
Fence/Guarding/Barricades/Gates			Junction Box		
Blocking					
Platform/Steps/Ramps/Walkways			CARRIERS		
Belts/Guards			Carriers		
Hoses (Air/Hydraulic)			Safety Bars, Belts		
			Safety Restraints, Latches		
OPERATIONAL			Anchors/Spindles/Attachments		
Brakes					
Correct			DRIVE		
Anti-rollback Devices, Backstop			Motor		
Instructional Signs			Controls		
Automatic/Manual Safety Devices			Cables		
Each Operator Trained			Wheels		
Test Cycles					
Communication Equipment					

This form may be duplicated by the Amusement Company.

_____
Operator's Signature

_____
Owner/Manager's Signature

INSTRUCTIONS: Use above form for each amusement attraction/device as per Florida Statutes, Sect 616.242. Correct all deficiencies (noted in the comment column) before operation. Circle and ini deficiencies when corrected. Submit all Daily Inspection Forms to Fair Manager/Coordinator bef opening ride to the public. You must keep the last 14 days of the Daily Inspection Forms on according to State Statutes.

White-Fair/Event Coordinator Yellow-Amusement Company

EJECTION SEAT INSPECTION CHECKLIST

Type of Inspection (Daily, Yearly, etc.):_____

Maint. number	Items to check	Inspection Time Interval					☑ Item Inspected	Inspected by (initial)	Date of Inspectio
		On Erection Disassembly	Every Launch	Daily	2000 Ejections	Yearly			
1	Ejection Elements	X	X						
2	Swivel Interface	X		X					
3	Chair Interface	X		X		X			
4	Chair	X		X					
5	Seat Belts	X	X						
6	Suspension Cables	X		X					
6	Turn Buckles	X		X					
6	Rapid Links	X		X					
7	Seat Cushion	X		X					
8	Guy Wires	X		X					
9	Shackles	X		X					
10	3/4" pins	X		X					
11	3/4" & 7/8" bolts	X			X				
12	Tower Sections	X			X				
12	Struts	X			X				
12	Beams & Angles	X			X				
13	Wooden Blocking	X			X				
14	Turn Buckles and Guys	X			X				
15	Hoist Cable Sheaves	X			X	X			
16	Hoist Cables	X	X						
17	Cable Bumpers	X		X					
18	Swivels	X		X					
19	PVC tubing	X			X				
20	Winch Cable Attach Bolts	X			X				
21	Winch support bearings	X			X				
22	Gear Box oil level					X			
23	Motor Lube					X			
24	Aux Brake airgap				X				
25	Brake Motor Airgap				X				
26	Hoist Cable Free Play	X		X					
26	Rotary Limit switch			X					
27	Control Panel	X		X					
28	Electrical System	X		X					
29	Release Mechanism	X	X						
30	Release Cable	X		X					
31	Anchor Cable	X		X					
32	Anchor Cable Tensioner	X		X					
33	Hydraulic Dampeners	X	X						
34	Boom Bearings					X			

ADVENTURES

December 21, 1994

Peter Walker
Infinite Adventures
801 New Jersey Ave.
North Wildwood, NJ 08260

Dear Mr. Walker,

Re: Annual Non-Destructive Testing for the Ejection Seat Amusement Ride in Florida

The only NDT that is required at this time is a visual inspection of all of the welds on the ride with special attention given to some of the welds on the chair assembly itself.

Special attention on the chair assembly should be given to;

1) Where the pad eyes are welded to the inside of the 2 inch pipe ring
2) Where the two legs attach to the bottom of the welded tube steel frame
3) The interface between bottom of the ring and the 3/8 inch plate where the release mechanism attaches

It should be noted that this visual inspection of the welds on the chair is part of the Manufacturer's Recommended Maintenance on a periodic basis.

Should you or your Engineer who will be performing the NDT have any further questions, please feel free to call. I will be available during the Christmas holidays.

Merry Christmas!

Sincerely,

Peter Kockelman

Peter Kockelman, President

Section 5

10 HP 26 @ 230
15HP 36 @ 230
50 @ 208

General Maintenance

1. Elastic Ejection Elements (3E's)

The elastic ejection elements are the single most important piece of equipment on the Ejection Seat after the hoisting cables in terms of maintenance and inspection. The elastic ejection elements have a finite life and must be changed regularly. All elastic elements must be purchased only from Bungee Adventures of Mountain View, California. Under NO circumstance should any other elastic element by any other manufacturer be used on the Ejection Seat.

The elastic ejection elements must be replaced every 400 launches and both cords must be replaced as a set. The cords may have to be retired earlier under the following conditions:

a. If the chair is landing more than 2 feet from the center attachment point.

b. If the chair is coming down tilted to one side such that when no people are in the chair and the hoisting cables are adjusted properly one foot of the chair is more than 2 inches higher than the other.

c. If there is a bunching of the rubber accompanied by broken strands where the diameter is noticeably larger.

d. If at any time the elastic ejection elements and chair behave in an unpredictable or unusual manner or exhibits any behavior that could result in harm to the participants, spectators, or crew.

e. If there are more than 60 broken strands in either elastic ejection element

2. Elastic Ejection Elements To Swivel Interface

The elastic ejection elements to swivel interface connects the elastic ejection elements to the 3 ton swivel. This weldment needs to be inspected for cracks and for localized plastic yielding of the steel at all 3 holes. The holes may only be 1/8 larger than the diameter of the pin or bolt that passes through it.

The bolt that connects the cord to the interface is an ASTM A325 3/4 inch diameter hex head bolt and a hex jamb nut and safety pin.

Maintenance Continued:

The hex jamb nut is to be placed on finger tight and a safety pin has to be placed through the hole at the end of the bolt to retain the nut.

This bolt, nut, and safety pin are to be visually inspected for wear. Replace any bolt that is worn, deformed, or bent.

Inspect the pin that attaches the interface to the swivel using the above criteria. This pin is a 1 inch diameter pin that uses 2 hex jamb nuts and 2 cotter pins. These nuts should be finger tight as well and both cotter pins should be bent over.

The above inspection must be conducted prior to attaching a cord to the interface.

3. Elastic Ejection Elements To Chair Interface

This interface performs the same function as a universal joint on an automobile driveshaft. Its job is to provide a low friction, non wearing joint between the elastic ejection elements and the chair. This joint also prevents the rubber from the elastic ejection elements from side loading and then coming off the spool when the participants are falling in a face down orientation.

This interface must be inspected daily or whenever an elastic ejection element is hooked up. The inspection criteria and procedures are identical to those of the elastic ejection elements to swivel interface. The only difference is that the 2 tapered roller bearings need to be inspected for free play. Any free play should be taken out by removing a safety pin and tightening the castle nut and then replacing the safety pin.

These bearing are lubricated from the factory and the grease is held in by 2 grease/ dirt lip seals. Once a year this bearing shaft assembly needs to be disassembled and the bearings, shaft, and housing cleaned in solvent and inspected for any wear in the form of pits or galling. If any wear is found, replace the inner and outer races of both bearings. Repack them with a lithium based grease and replace both grease seals before reassembled.

Maintenance Continued:

4. Chair

The chair provides a rigid means of attaching the elastic ejection elements, release mechanism and participants in a lightweight steel carrier. The chair needs to be inspected daily before any launching occurs by inspecting all welds for cracking, all steel members for bending or deformation and all welded eyes for cracking or bending.

If any cracked welds are found on the chair, the chair must be sandblasted and all the welds subjected to a dye penetrate test to determine the extent of the cracking. Bungee Adventures must be notified after any cracks are found in order to specify the appropriate repair procedures.

5. Seat Belts

The seat belts are constructed of sewn nylon webbing with a breaking strength of 5000 pounds. All the other components which include the snaps, D rings, friction adapters, and connecting links have a minimum strength of 2000 pounds.

Two identical belts are used to secure the participants to the chair. Each belt is padded over the shoulder and across the waist and the geometry of the belt across the body is similar to an automobile's waist/shoulder restraint system.

The nylon webbing, D rings, butterfly snap, and friction adapters are to be inspected every launch.

Any belt that exhibits any of the following conditions must be retired and replaced immediately before any launches are to be performed with that belt.

a. Any torn or excessively worn nylon belting

b. Any broken stitches

c. Any malfunction in the butterfly snap

d. Any friction adapter that slips after it has been tightened

e. Any piece of hardware that appears bent, broken, strained, cracked or elongated.

Maintenance Continued:

6. Suspension Cables, Turnbuckles, and Connecting Links

The suspension cables, turnbuckles, and connecting links are all part of the tensioning system that suspends and secures the chair within the tubular steel ring. All of these components have a breaking strength in excess of 3000 pounds.

These components along with the connecting links that secure the seat belts to the chair must be inspected at the beginning of each day.

All suspension cables must be checked for tightness and any cable that can be pushed more than 1/2 inch off its normal position with about 10 to 15 pounds of force should be tightened by turning its turnbuckle. The longer cables can move up to 1 inch with the 10 to 15 pounds of force. All cables should be tensioned uniformly and the chair should exhibit no sway back and forth within the ring when this condition is reached. Tighten the turnbuckles by hand and do not over tighten.

After 300 launches, the cables should not need much if any adjusting. Any cable that seems to always need to be tightened should be checked to see if it is slipping by recording the length of the cable daily and see if it continually gets longer or by inspecting the swages.

Replace any cable that has any broken strands.

Replace any cable that appears to be elongating after the first few hundred launches.

Replace any turnbuckle that is bent, cracked, deformed or has stripped threads. Make sure that all clevis pins have nylon inserted lock nuts on and that they are secure.

Check all connecting links by hand for tightness and visually to see if any threads are exposed. Tighten them using a small crescent wrench if they are loose and replace any that appears bent, cracked, deformed, or has any stripped threads.

Maintenance Continued:

7. Seat Cushions

Each seat cushion is held in place by 4 bolts. The bolts that secure the back cushion are metric and screw into tapped steel and can be tightened securely without the possibility of stripping the threads. The seat cushions, however, have sleeve inserts pressed into plywood and will strip or spin if too much torque is applied. Do not overtighten the seat bolts.

Inspect the seat cushion bolts for tightness and retighten any that are loose. Repair any threaded inserts that become stripped.

8. Guy Wires

The 5/8 inch guy wires on the Ejection Seat have to be tensioned properly in order to limit the deflection during the course of a launch. The tension needs to be inspected daily along with the condition of the guy wire as well as watching for any signs of the swags slipping.

The guy wires can be divided into 2 groups of 12. The first group of 12 attach to the main 100 feet I Beam and keep the columns from excessively swaying during the loading of the elastic ejection elements and the subsequent release and rebounding of the chair. All these guy wires should be tensioned using the turnbuckles such that each tower bows 3 to 4 feet away from the center of the structure and no cable has more than 2 inches of slack when the chair is sitting on the ground.

The second group of 12 wires attach to the 40 feet outriggers and should be tensioned so that the towers are in line with each other when viewed 50 feet from the end of and in line with the 100 foot I Beam and have no more than 4 inches of slack when the chair is sitting on the ground.

Replace any guy wire that has used up all the free play in its turnbuckle and is still not properly tightened.

Maintenance Continued:

9. Shackles

The shackles connect the guy wires to the steel beams and towers and to the turnbuckles. Each is a 3/4 inch shackle with a bolt and nut to secure it.

Everyday make sure all shackles have nuts and safety or cotter pins through the end. Replace any shackle that has a bent bolt, threads are galled or stripped or that has sustained a fall onto a hard surface from over 10 feet.

10. 3/4 Inch Diameter Pins

The pins that connect the tower sections and struts together are fabricated using heat treated 4140 alloy steel and must not be replaced by any other than a factory replacement part.

The steel in the pin is twice as strong as the tubes it connects so the tube steel will bend before the pins do.

If a pin is misplaced or lost, a 3/4 inch grade 5 or grade 8 bolt will suffice until the pin can be replaced. However, the threads must be totally outside of the tube.

Inspect the tower daily and verify that all the pins are in place and that there is roughly an equal length of pin extending from either side of the pinned joint. If there is not, investigate further to see if a pin has sheared or there is a further problem. Verify that there is a safety or cotter pin securely attached through the holes at both ends of the pin.

On disassembly, replace any pin that is bent, cracked, excessively pitted, worn, or appears squished in any way.

If after many erections the end appears mushroomed because of the hammering, grind off the mushroomed edges, but do not use a torch on it.

Maintenance Continued:

11. 3/4 inch and 7/8 inch Bolts

All 3/4" bolts are ASTM A325 and all 7/8" bolts are ASTM A490. All bolts are to be inspected for tightness every 2000 launches and for wear and tear every time the ride is erected or disassembled.

Every 2000 launches take the appropriate wrench and make an attempt to tighten each and every bolt on the ride. There is no need to use an extension nor do the bolts have to be tightened by the turn of the nut method due to the design of this ride. The torque requirement is as tight as a normal man can make it with a normal wrench.

Every erection or disassembly inspect each bolt carefully for any signs of bending, cracking, severe pitting, stripped or smashed threads. Replace any bolt or nut with any of the preceding conditions.

Below is a checklist of the quantity and location of the bolts.

	Quantity	Location
A.	8 - 3/4"	Main I beam to outrigger cross braces
B.	4 - 3/4"	Main I beam to outriggers
C.	6 - 3/4"	Splice on main I beam (see note below)
D.	43 - 7/8"	Splice on main I beam (see note below)
E.	4 - 3/4"	Winch attachment bolts
F.	4 - 3/4"	Winch pillow block bearings

Note: The 6 - 3/4" splice bolts are found on the rides where the main I beam is split into 2 - 50' sections and the 43 - 7/8" splice bolts where the main 100' I beam is split into 2 - 40' sections and 1 - 20' section.

Maintenance Continued:

12. Tower Sections, Struts, I Beams, Angles and Channels

The 4 telescopic tower sections, the 8 struts or knee braces for the 2 towers, all I beams, and the I beam cross bracing are to be visually inspected every 2000 launches. All steel structural members are to be straight and free of rust. No member should ever appear bent or distorted under normal wear and tear, however, the possibility exists after a sever wind storm or hurricane where the winds have exceeded 100 mph. Call the manufacturer if you have any questions or doubts.

The steel shall remain free of rust and all bare steel shall be first primed using a Sherwin Williams water based primer followed by a "Safety Red" finish coat.

Every time the structure is erected or disassembled all steel members need to be inspected for damage during shipping or the last disassembly in the form of bent or distorted steel members. In addition, all pin holes and bolt holes should be inspected for cracking, plastic yielding, stretching or elongating where the diameter of the hole machined for the 3/4" pin or bolt is larger than 7/8" or 1" where a 7/8" bolt would go.

Contact the manufacturer for repair or replacement procedures whenever a condition like the above exists.

13. Wooden Blocking

The wooden blocking consists of 6"x6"x24" pressure treated wood that distributes the weight of the amusement ride over a larger area

All blocking should have a part of the load of the ride and should be shimmed if any play is felt between a block and the steel.

Replace any blocking where splits in the ends extend more than 4 inches.

Maintenance Continued:

14. Turnbuckles and Guy Wires

The turnbuckles used on the Ejection Seat are galvanized and have a 1" rod diameter. All turnbuckles should be lubricated prior to erection and prior to disassembly. Use a light lubricant like WD 40 and spray directly onto the threads to reduce the torque required to tighten the turnbuckles and to prevent the threads from galling.

Every 2000 launches inspect the quy wires for proper tension and adjust the turnbuckles to tension the wires properly. Do not allow the top section of the turnbuckles to rotate while adjusting the turnbuckles.

Replace any turnbuckle that is bent or appears to have stretched or deformed in any way.

15. Hoist Cable Sheaves

All hoist cable sheaves are 10" diameter sheaves approves specially for 3/8" wire rope. Each is fitted with two opposed tapered roller bearings and two grease seals. The bearing come lubricated from the factory and are relatively maintenance free.

Every 2000 launches all sheaves need to be inspected excessive free play. If any free play exists, remove one cotter pin from the shaft and tighten the castle nut until the free play is removed or there is a slight amount of free play felt. Replace the cotter pin and spread the ends to secure it in place.

If the bearing is noisy when the sheave is spun by hand, vibration or grinding is felt or heard, or the sheave is a little difficult to turn by hand, the sheave must be immediately removed and the bearing removed and inspected as if it were a yearly inspection.

Yearly inspection procedure: Once a year remove all sheaves. Discard the grease seals. Clean the bearings, the outer races and housing in solvent and inspect the rollers and the inner races for pits, discoloration, spalling, corrosion, or cracks. Remove and replace the inner and outer races as a set if any of the above wear conditions exist. Repack the bearing cup with a general purpose lithium based grease and press new grease seals into both sides of the sheave.

Maintenance Continued:

16. Hoist Cables

The hoist cables consist of 6x19 extra improved plow steel (XIPS) independent wire rope core (IWRC) with a diameter of 3/8". The braking strength should be in excess of 15,000 pounds.

Both hoisting cables should be inspected before tower erection or disassembly and daily and must be replaced if any of the following conditions exist:

a. Six randomly distributed broken wires in a rope lay or four broken wires in one strand of a rope lay. A rope lay is the length along the rope in which one strand makes a complete revolution around the rope.

b. Abrasion, scrubbing or peening causing loss of more than 1/3 of the original diameter of the outside individual wires.

c. Severe corrosion

d. Kinking, crushing, bird-caging or other damage resulting in distortion of the rope structure.

e. Heat damage

f. Reduction from normal diameter of more than six percent ie: .375 " reduced to .353"

g. Bird - caging or other distortion resulting in some members of the rope structure carrying more than others.

h. Noticeable rusting or development of broken wires in the vicinity of swage ends.

Maintenance Continued:

17. Cable Bumpers

The cable bumpers consist of 2 polyurethane energy absorbing bumpers that compress against the spool that sits on the swaged end of each hoisting cable. The purpose of these bumpers is to:

a. Cushion the swaged end of the hoisting cable from the cable guide
b. Keep some tension in the hoisting cable as the release chair passes the tops of the towers.

The bumpers are to be inspected at the beginning of each day to verify their existence and to verify they are free of cracks or defects and that they are still rounded in shape and not flattened out.

Replace any bumper that exhibits any of these problems.

18. Swivels

Each elastic element is attached to a hoisting cable via a 3 ton swivel that has a breaking strength of over 24,000 pounds. The purpose of the swivels is to allow the elastic element and hoisting cable to rotate independently of each other.

The swivels must be inspected daily for any permanent deformation (stretching), swivel end play, or gap of more than 1/16" along the axis of the swivel. Immediately remove from service and replace any swivel that exhibits any of the preceding conditions.

Do not operate the Ejection Seat without a manufacturer recommended swivel.

19. PVC Tubing

The PVC tubing on the Ejection Seat protects the workers and operators from coming into contact with the hoisting cable and provides a scar free channel for routing the hoist cable back to the winch.

Verify every 2000 launches that the tubing is secured to the supports on the I beam and that it runs in a fairly straight line from the far tower to the winch. Also verify that the hoist cable has not worn through at any area and replace any worn through sections.

Maintenance Continued:

20. Winch Cable Attachment Bolts

The winch cable attachment bolts secure the hoisting cable to the winch drums. Every 2000 launches verify that the nuts are tight using a standard open end wrench. Do not over torque these nuts. A sufficient torque would be between 10 and 20 foot pounds.

For fixes installations, a high strength thread locking compound like LoctTight should be used on the threads of the nut and bolt prior to torquing the nuts.

21. Winch Support Bearings

The winch is supported by 2 self aligning pillow block ball bearings.

These bearings are over designed for their use on this amusement ride so they should offer an almost maintenance free life.

These bearings should be inspected every 2000 launches. At the end of a operating day, these 2 bearings should be fairly cool to the touch when they are not in the direct sun light. They should be quiet and free of vibrations when the winch is operating and there should be no noticeable play between the shaft and the bearing at any time.

If any of the above conditions exist, the bearings should be replaced.

Because these bearings come lubricated from the factory and they are sealed, they need relubrication only once a year unless they are operating in severe conditions such as very high humidity or excessively dirty enviorments.

When lubricating use a lithium base NLGT Grade No. 3 grease having a viscosity of 65 to 108 CST at 38 degree C (300 to 500 SVS at 100 degree F) when the ride will be operated between 0 degree C and 93 degree C For colder climates (-40C to 121C) use a Grade No. 1 grease.

Using a grease gun, pump grease in slowly until grease begins to appear at either seal.

CODE 2319 ***MEROPA*** 68
CODE 2601 ***MEROPA*** 100
CODE 2320 ***MEROPA*** 150
CODE 2321 ***MEROPA*** 220
CODE 2324 ***MEROPA*** 320

CODE 2325 ***MEROPA*** 460
CODE 2342 ***MEROPA*** 680
CODE 2343 ***MEROPA*** 1000
CODE 2344 ***MEROPA*** 1500
CODE 2349 ***MEROPA*** 3200

Typical Characteristics

Meropa	68	100	150	220	320
Appearance	Light to Very dark red				
Gravity, API	28.7	27.5	27.4	26.2	25.9
Flash, COC, F	415	420	440	440	460
Pour Pt., F	-35	-25	-25	-10	-15
Visc., cSt at 40 C	68.4	105	141	219	329
cSt at 100 C	9.1	12.1	14.5	18.9	24.9
SUS at 100 F	333	544	738	1158	1798
SUS at 210 F	56	67	78	96	122
Viscosity Index	108	105	102	97	98
Phosphorus, %	0.018	0.018	0.018	0.018	0.018
Timken OK Load, lbs	60	60	75	75	75
AGMA No. EP	2	3	4	5	6

Typical Characteristics

Meropa	460	680	1000	1500	3200
Appearance	Vy Dk Red	Opaque green bloom			
Gravity, API	26.0	22.8	22.8	22.2	19.5
Flash, COC, F	475	475	475	505	480
Pour, F	-20	5	15	20	40
Viscosity cSt at 40 C	438	700	1072	1635	3172
cSt at 100 C	32.3	41.0	50.0	61.4	88.6
SUS at 100 F	2544	3628	5596	8080	17836
SUS at 210 F	155	189	247	309	432
Viscosity Index	102	98	91	91	83
Phosphorus, %	0.18	0.018	0.018	0.018	0.018
Timken OK Load, lbs	75	75	60	60	60
AGMA No. EP	7	8	—	9	10

The ***Meropa*** series of industrial EP type gear oils has excellent oxidation and thermal stability. They resist thickening induced by high temperatures as in steel mill applications where gear cases are often in close proximity to the red hot steel. ***Meropas*** are inhibited to provide good foam resistance and have superior water separating characteristics which make them ideal for circulating systems where water contamination is a constant hazard. They are non-corrosive to gear and bearing materials such as steel, copper, bronze, babbit or cadmium-nickel. The lower viscosity grades have low pour points which makes them suitable for use in gears and bearings exposed to winter weather.

Meropa lubricants are suited for the lubrication of a wide variety of industrial and mobile equipment, gear systems, chain drives, sprockets, plain and antifriction bearings, slide guides, flexible couplings, etc. They excel in the lubrication of heavily loaded enclosed gear drives and reducers from fractional horsepower gearmotors to the large high horsepower units on metal rolling mills and mine hoists. They are suitable for the lubrication of a variety of gears including spur, bevel, herringbone and worm designs. They are also suitable for the lubrication of industrial hypoid type gears where speed, temperature and loads are not excessive. ***Meropas*** are recommended for use in transmission gear cases and worm drive axles on mobile contractor type equipment and open pit and underground mining machinery. ***Meropas*** are adaptable to bath, splash, circulating, and spray-type lubrication systems.

These products meet the performance requirements of extreme pressure lubricants of the American Gear Manufacturer's Association (AGMA) Specification 250.04 "Lubrication of Industrial Enclosed Gearing." They also meet US Steel specification 224 requirements.

Maintenance Continued:

22. Gearbox Oil Levels

Both gearboxes for the brake motor and the auxiliary brake have been filled at the factory. Both boxes have oil level plugs that can be removed periodically to verify oil level. Oil should flow out if the plug is removed.

Gear oil should be changed yearly. Do not mix synthetic and mineral base oils. Depending on the ambient temperature range of operation, the type and viscosity of the oil will change. For 16 degree F to 125 degree F use an ISO grade 220 EP and ISO Grade 100 - 150 Ep for -10 degree F to 75 degree F operation.

Units should be checked periodically for increased noise, surface temperature, vibration, shaft movement and amperage draw.

23. Motor Lubrication

The motor need to be relubricated once a year.

24. Auxiliary Brake Airgap

The auxiliary brake is a fail safe electrically released back up brake. Due to its construction, this brake takes longer to release and to set than the other brake attached to the motor.

In order for this brake to operate properly, the airgap must be adjusted properly every 2000 launches. The airgap should be set between 0.010" and 0.012: every time it is adjusted.

Because this brake does not wear appreciably, it does not need frequent adjustment. Before adjusting this brake, loosen the three 13mm nuts that hold the electric magnet against the airgap, adjusting nuts until only 1-2 threads are engaged and adjust and test the main brake before adjusting the auxiliary brake.

After adjusting the main brake, adjust the airgap on the auxiliary brake to the specified gap and tighten the 3 outermost nuts.

Test the auxiliary brake by tensioning the cords as if you were going to perform a test launch and then manually releasing the main brake so that all the torque is on the auxiliary brake. The auxiliary brake should hold the load without slipping.

Maintenance Continued:

25. Brakemotor Airgap

The brake on the brake motor is a fail safe electrically release brake that is designed to stop the motor quickly and to hold the motor in one place after the power has been shut off to the motor. This brake also comes with a lever so that in the event of a power failure, the brake can be manually released for a controlled lowering of the suspended chair and its participants.

In order for this brake to operate properly, the airgap must be adjusted properly every 2000 launches. The airgap should be set between 0.012" and 0.015"

To se the Airgap:

a. Remove the manual release lever and the fan cover
b. Loosen the two 1/2" nuts that secure the manual release lever to the electro magnet about 4 turns.
c. Measure the airgap using a feeler gage.
d. If the gap is not between 0.012 and 0.015 inches, use a shortened allen head wrench and loosen the three socket head cap screws and turn the adjusting nuts behind them until the proper gap is obtained.
e. Retighten the 3 socket head cap screws and remeasure the airgap. Follow steps D and E until the airgap is correct.

To test the brake:

f. Release the auxiliary brake by following the steps listed under "Auxiliary Brake Airgap"
g. Operate the system normally and tension the cords as if you were to perform a test launch. The system should operate and hold the tension with only the main brake functioning and the winch must not roll backward before coming to a stop.
h. Tighten the 2 1/2" nuts that secure the manual release lever uniformly until the tension in the cords can be release manually via this lever.
i. Replace the fan cover.

Replace the friction disc when the thickness of the friction material is less than 0.030 inches on a side.

Adjust the airgap for the auxiliary brake at the conclusion of the main brake's adjustment.

Maintenance Continued:

26. Hoist Cable Freeplay/Rotary Limit Switch Adjustment

The hoisting or lowering of the elastic elements is under manual control but its full range motions are limited by a geared rotary limit switch that is coupled to the end of the shaft that supports the winch. This switch shuts off power to the brakes and motor and stop the hoist a few inches shy of the top of the tower. This switch also stops the hoist from completely unwrapping all the cable from the drum.

Before the hoist cable free play can be set properly, the timing delays must be set and then not tampered with (see electrical system)

Once the on delay and off delay timers have been initially set, set the upper most limit by:

a. Attach the empty chair to the release mechanism and with the elastic ejection elements in place raise the chair until it is suspended 20 feet off the ground.
b. Remove the cover from the rotary limit switch and locate the switch inside that has the two white wires attached to it. This switch limits the hoisting action.
c. Follow the directions on the inside of the cover of the rotary limit switch to adjust the cam so the motor is shut off 0 - 2 inches prior to the cable bumper from coming into contact with the cable guide at the top of each tower.
d. Adjust the switch gradually so the hoisting action is shut off 20 feet from the top, then 10 feet, then 5 fee, then 3 feet, then 16 inches, 8 inches 4 inches and finally 2 inches.
e. If the free play on each tower has a difference of more than 2 inches, take up the difference by adjusting the cable at the winch.
f. These adjustments must only be carried out with the cords fully tensioned.

Now that the upper limit has been set you can adjust the lower limit by the following instructions:

g. Locate the switch with the two black wires attached to it. This switch limits the lowering action.
h. Follow the directions from C and D above so the motor is shut off with 1 to 3 wraps left on the drum or so that am operator can easily inspect the swivels and ends of the hoist cables.

Maintenance Continued:

26. Continued:

I. Retighten the two screws that secure the cams and replace the cover on the rotary limit switch.

The hoist cable free play will have to be adjusted periodically due to the cables stretching over time and if a cable has been replaced recently. However, on a permanent installation there should come a point where adjustment will not be necessary.

27. Control Panel

The controls for the Ejection Seat are housed in a waterproof enclosure that is located near the release lever and the hydraulic boom. The controls consist of a keyed power switch, a raise/lower selector switch, a power indicator lamp and an emergency stop and a start cycle switch.

The emergency stop and start cycle switches are not connected as they are included for a later upgrade of the original system.

The controls should be inspected daily to verify that they are working properly and are not difficult to operate. The spring centered off selector switch that controls the raising and lowering of the hoist should snap to its off position when released.

The keyed power switch should shut off power to the control panel and should be able to be removed in the off position and not removed while the power is on.

Verify that the controls are not broken and are tightly held to the enclosure.

Maintenance Schedule

The periodic maintenance required for the Ejection Seat Amusement Ride is divided into the tasks to be performed upon erection or disassembly, and those tasks to be performed on a per launch or time based schedule.

All items outlined in this section must be performed when indicated and by a person capable of performing those duties.

Preventative maintenance is the best way to prevent costly downtime and to insure the public a safe and exciting ride.

Items to check	On Erection Disassembly	Every Launch	Daily	2000 Ejections	Yearly
Ejection Elements	x	x			
Swivel Interface	x		x		
Chair Interface	x		x		x
Chair	x		x		
Seat Belts	x	x			
Suspension Cables Turn Buckles Rapid Links	x		x		
Seat Cushion	x		x		
Guy Wires	x		x		
Shackles	x		x		
3/4 pins	x		x		
3/4 & 7/8 bolts	x			x	
Tower Sections	x			x	
Struts	x			x	
Beams & Angles	x			x	
Wooden Blocking	x			x	
Turn Buckles	x			x	
Hoist cable pulleys	x			x	x
Hoist cables	x	x			

Items to check	On Erection Disassembly	Every Launch	Daily	2000 Ejections	Yearly
Release Cable	x		x		
Anchor Cable	x		x		
Anchor Cable Tensioner	x		x		
Hydraulic Damp	x	x			
Boom Bearings					x

ROTARY LIMIT SWITCH
TROUBLE SHOOTING

1. ARE SET SCREWS ON FLEXIBLE COUPLING TIGHT?

2. ADJUST BOTH BRAKES FOR AN AIRGAP OF 0.012"

3. ADJUST ROTARY LIMIT SWITCH TO STOP CABLE 2" - 4" FROM THE SWING ARMS.

4. MARK THE DRUM AND CYCLE SEVERAL TIMES, CHECK THE FOLLOWING:

   -DOES THE DRUM STOP LOCATION REPEAT?
   -DOES THE CABLE STOP LOCATION REPEAT?
   -IS THE DRUM BACKSLIDING WHEN STOPPED?

5. CHECK CAM LOBES FOR WEAR.

6. CHECK FOR WEAR ON GEARS.

7. DISCONNECT THE FLEXIBLE COUPLING AND INSPECT THE SHAFT BEARINGS FOR RADIAL AND AXIAL PLAY.

8. TRY USING ANOTHER SWITCH AND/OR DISCONNECTING THE CABLE AND ROTATE THE DRUM TO A NEW LOCATION BEFORE RECONNECTING THE CABLE SO THAT A NEW SECTION OF THE GEAR WILL BE USED.

ADVENTURES

Certificate of Completion

This certificate hereby certifies that Peter Walker and Murray Barrett have successfully completed the Ejection Seat training program. As required by the program, both men have demonstrated a significant level of competence and understanding, and are fully knowledgeable and trained in the areas of TRANSPORTATION, ERECTION, DISASSEMBLY, MAINTENANCE, AND TROUBLESHOOTING of the Ejection Amusement ride.

Peter Kockelman

Peter Kockelman
President, Instructor

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ADVENTURES

Memo

To: Peter Walker, Infinite Adventures, Inc.

From: Peter Kockelman P.K.

Date: January 31, 1995

Subject: Shackle replacement

Please accept this memo as authorization from the manufacturer for Infinite Adventures, Inc. to replace the originally supplied 4&3/4 shackle with a Crosby 4&3/4 shackle. Listed below is some information for this shackle:

Maximum force on shackle @ 70mph wind: 2,105lbs

Working strength of shackle: 9,500lbs

Breaking strength of shackle: 38,000lbs

In addition, the manufacturer feels it is inconsequential in regards to the manufacturer or origin of a similar replacement part as long as the part meets or exceeds the currently required minimum size and strength.

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ADVENTURES

December 12, 1994

Peter Walker

Infinite Adventures
801 New Jersey Avenue
North Wildwood, NJ 08260

Re: Launch Arm Modifications

Dear Mr. Walker,

We have reviewed your photos, sketches, and information pertaining to the modified launch arm and have found your design to be comparable or better than the original launch arm that was shipped with your ride initially. We think you have done an excellent job improving the problem areas of the original launch arm.

These modifications meet the standards set by Bungee Adventures Inc. for the safe operation of the Ejection Seat amusement ride.

We did notice that the way your launch arm collapses, an employee would have a difficult time adjusting the flow controller. To protect an employee from getting his hand crushed you should come up with a procedure that allows for safe adjustment of this valve.

Sincerely,

Peter Kockelman

Peter Kockelman, President

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