

MFB: CHANCE
RIDE: AVIATOR

AVIATOR™

Field inspection and test guide

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Introduction

Proper maintenance is essential to the safe operation of this ride. The inspection points outlined in this field inspection guide are not intended to replace the recommended maintenance schedule. This guide does not contain maintenance and repair procedures and should only be used as a ride inspection guide.

When repairs are necessary use only those components authorized, specified or provided by the manufacturer. If any alterations, modifications and/or additions, installations of unauthorized components are made to the original design without the manufacturer's explicit written consent or without direct supervision by a manufacturer's representative, CHANCE RIDES INC., makes no claims as to the integrity of the altered or modified ride (product).

Information in this field inspection guide applies only to products manufactured by CHANCE RIDES INC. built after January 1, 1986.

CHANCE RIDES INC., reserves the right to make improvements in design or changes in specifications at any time without incurring any obligation to such changes.

Manufacturer's Specifications⁶

Reference Standard:

ASTM - F24 Standards on Amusement Rides and Devices

1. F583 Maintenance Procedures for Amusement Rides and Devices
2. F893 Inspection of Amusement Rides and Devices
3. F1159 Design and Manufacture of Amusement Rides and Devices

Chance Rides, Inc., at the time of the initial design and prototype manufacture, determines by calculations and testing the appropriateness of the functional design criteria. The visual esthetics of the ride are also evaluated and together with the functional design criteria make up the manufacturer's design specifications. These design specifications are adhered to on all subsequently produced rides of the same style. Occasionally, through field experience, it becomes necessary to specify a modification to the original design specifications. Actual modification to meet the change in design specifications can only be performed by qualified personnel,



following the directives of a Chance Rides, Inc. Service Bulletin, Service Kit, or a Chance Rides, Inc. representative, where applicable.

Any modification performed on a Chance Rides, Inc. product outside the recommended directives established by Chance Rides, Inc. as referenced above, constitutes an unauthorized modification. Chance Rides, Inc. specifically disclaims any liability for losses associated with any unauthorized alteration and/or modification to any of its products. Chance Rides, Inc. will not issue letters for the operation of rides which do not meet the manufacturing specifications; this includes cases where the non-conforming modification is of an aesthetic nature only.

It is the responsibility of the individual inspector to thoroughly inspect the ride as deemed necessary, based on his knowledge and field experience to determine that the ride meets the manufacturer's specifications and/or is safe for operation.

Ride description

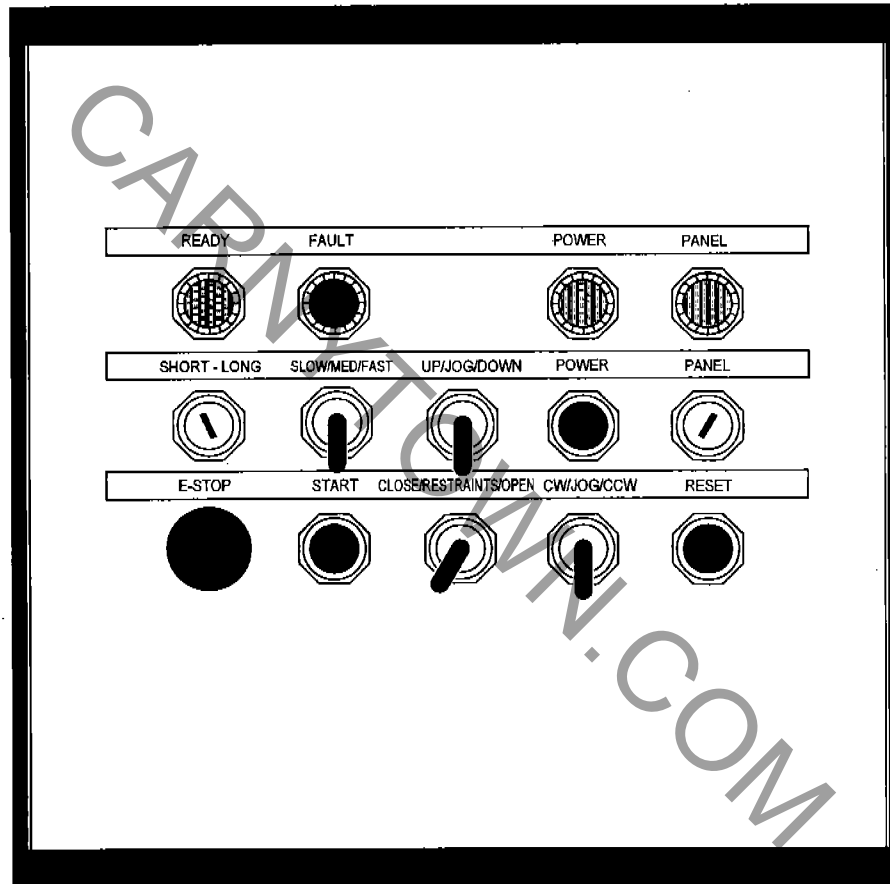
The **Aviator** is a park model ride, mounted on a stationary base. The ride is rotated by a variable frequency AC electric drive, with integral electro-mechanical (spring) brakes. The hydraulic system provides lift for the telescoping tower. The wings on each vehicle can be controlled by the rider to aerodynamically climb or dive after the vehicles are lifted clear of the landing surface.

The ride information plaque is mounted to the tower base structure of the ride. It lists specifications, operating dimensions, ground loads, as well as model and serial number and date of manufacture.

Detailed operation and maintenance information is available in the *Aviator Service Manual* (manual number 24000000). For more information, or to order manuals, contact CHANCE RIDES, INC.



Operation



IMPORTANT: The two MAIN POWER CIRCUIT BREAKERS in the main electrical box must be on before operating any of the controls on the operator's console.

1. **Ready Light** - This green light will come on when all passenger restraint bars are locked in the down position and the OPERATOR PRESENCE SWITCH is depressed. The ride cannot be started unless this light is on.



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2. **Fault Indicator Light** - This red light is normally off when the power indicator light is on. If the fault indicator light is on, a fault is indicated and the ride will not operate. Press the RESET SWITCH to clear the fault. If this is not successful, notify the appropriate maintenance personnel. The ride will not operate until the fault has been corrected.
3. **Main Power Indicator Light** - This green light is on when the two main power circuit breakers on the main electrical box are in the "On" position.
4. **Control Panel Power Indicator Light** - This green light indicates that power is being supplied to the control panel. It comes on when the CONTROL PANEL POWER SWITCH is turned on.
5. **Program Switch** - Use this key-operated switch to select either the short or long programmed ride cycle.

NOTE: *This switch is keyed the same as the control panel power switch.*

IMPORTANT: *Do not change the position of the PROGRAM SWITCH after the ride is started. This will interrupt the drive program and stop the ride.*

6. **Ride Speed Switch** - Use this switch to control the rotation speed of the ride, in conjunction with the wind speed indicator. Refer to "Operation in High Wind" in this section for more information.

IMPORTANT: *Do not change the position of the RIDE SPEED SWITCH after the ride is started. This will interrupt the drive program and stop the ride.*



injury.

WARNING: Operation in high winds can cause uncontrolled vehicle movement, resulting in serious personal

Always observe the wind speed indicator and follow these ride speed guidelines when operating in windy conditions.

Up to 25 mph wind	High Speed
25 to 20 mph wind	Medium Speed
30 to 35 mph wind	Low Speed
Over 35 mph wind	DO NOT OPERATE



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7. **Tower Jog Switch** - This switch controls the tower lift hydraulic system when the ride is not in the programmed ride cycle. Move the switch to either "Up" or "Down" position to raise or lower the tower. The tower will stop automatically when it reaches its full up or full down position. The jog feature operates only when the OPERATOR PRESENCE SWITCH is engaged. This switch is inoperable during the programmed ride cycle.

NOTE: *The hydraulic pump runs while the JOG SWITCH is engaged. It will turn off when the tower reaches its full up or full down position.*

8. **Power Switch** - Use this switch to turn off the main power circuit breakers in the main electrical box. The MAIN POWER INDICATOR LIGHT will go out when this switch is used.
9. **Control Panel Power Switch** - Use this key-operated switch to turn on the power to the control panel. The CONTROL PANEL POWER INDICATOR LIGHT will come on.

NOTE: *This switch is keyed the same as the program switch.*

10. **E-Stop Switch** - Press this palm switch to interrupt the drive program. The ride will come to a normal, programmed stop, after which the TOWER JOG SWITCH must be used to lower the tower for unloading of passengers. Pull the E-STOP SWITCH back out to its operating position for normal operation of the ride.
11. **Start Switch** - Use this switch to start the programmed ride cycle. The following conditions must exist for the ride to operate:
 - MAIN POWER INDICATOR LIGHT must be on.
 - E-STOP SWITCH (OPERATOR PRESENCE SWITCH) must be engaged.
 - READY LIGHT must be on
 - CONTROL PANEL POWER INDICATOR LIGHT must be on.
 - FAULT INDICATOR LIGHT must be off.
12. **Restraint Bar Switch** - Use this switch to lock or release the shoulder restraints bars. See "Safety Equipment" in this section for more detailed information.



13. **Rotation Jog Switch** - Use this switch in conjunction with the TOWER JOG SWITCH to jog the ride either clockwise (REV) or counter-clockwise (FWD). This feature allows the operator to precisely locate a specific vehicle for loading and unloading of passengers. The jog feature operates only when the OPERATOR PRESENCE SWITCH is engaged, and the vehicles are approximately six feet off the landing surface. This switch is inoperable during the programmed ride cycle.
14. **Reset Switch** - Push this switch if the FAULT INDICATOR LIGHT comes on. When the fault indicator light goes out, normal operation of the ride can be resumed.

NOTE: *If faults require frequent use of the RESET SWITCH, or if the FAULT INDICATOR LIGHT is still on after using the RESET SWITCH, notify the appropriate maintenance personnel.*

IMPORTANT: *Do not use the RESET SWITCH during the programmed ride cycle. Damage to the inverter and/or magnetic brake can occur.*

15. **Operator Presence Switch (not shown)** - This foot-operated switch must be engaged to operate the START or JOG SWITCHES. If the switch is released, the drive program is interrupted and the ride will come to a normal, programmed stop, after which the TOWER JOG SWITCH must be used to lower the tower for unloading of passengers.



Operating the ride (test cycle)

The operating procedure is provided on a decal, mounted in the cover of the operator's control console. Make sure the decal is legible. Test the operation of all controls. Throughout the ride cycle, check for correct rotation speed and tower lift height, and proper operation of all limit switches.

Check the overall performance of the ride based on previous operating performances of the individual ride.

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General inspection and testing

Testing

Field performance testing of amusement rides¹

The following specifications conform with ASTM F846 standard guide for *Testing Performance Of Amusement Rides And Devices*, in effect on date of ride manufacture.

Erection or installation testing

Each erection or installation of a ride shall be given an inspection prior to carrying passengers that shall include but not be limited to the following:

- a. Determine that ride has been erected according to the set-up procedures in the operations manual.
- b. Inspect field inspection points listed in the *Field Inspection Guide*.
- c. Visual check of all passenger carrying devices including restraint devices and latches, and the pins and capscrews securing them.
- d. Visual inspection of entrances, exits, stairways and ramps and devices securing them.
- e. Test of all communications equipment necessary for operation of the ride or device.
- f. Operate the ride to determine that direction of travel conforms to the information plate, ride manual field inspection guide of specification sheet.
- g. Operate the ride for a minimum of three ride cycles to determine that the ride speed does not exceed the speed specified in the information plate, ride manual, field inspection guide, or specification sheet.

Daily pre-opening inspection

This inspection shall include a daily inspection of all items as specified in the previous item (erection or installation testing).

¹ B090R1002-0 May 14, 1986



Documented field performance and operational testing

Documentation and certification shall be performed by a person who by demonstrated education and field experience is knowledgeable with construction, erection, operation, maintenance and repair of amusement rides.

Operational load testing

Any operational test including load testing performed on a ride shall be completely non-destructive in nature. Overload testing exceeding the rated limits listed on the information plate, operation manual, field inspection guide or specification sheet shall be deemed inappropriate. Where maximum total passenger weight is not readily available, passenger capacity multiplied by 170 pounds per adult and/or 90 pounds per child may be used.

Non destructive testing with inert loads can be accomplished only with special care as to placement of the load so that it is centered both vertically and horizontally as would be the load of the passenger it replaces. Extra seat reinforcement must be used to offset any load concentration created. Such tests shall be documented and certified as non-destructive by the person making the test and the agency requiring it. Results of all load tests shall be communicated to the factory upon completion by the certifying agency.

Conducting a non-destructive operational load test assures the testing agency only that it will carry a given load in a given way at a given moment and in no way assures future safety of the ride.

Conducting a destructive load or overload test also assures the testing agency that it will carry a given load in a given way at a given moment and in no way assures future safety of the ride. However, it also introduces the probability of inflicting serious irreparable damage to the ride that may or may not be apparent at the time of the test.

CHANCERIDES, INC. considers inert load testing of any nature appropriate only for situations requiring experimental development of stress-strain testing during prototype development. A certificate of load test on the prototype and certification that each production ride met the design criteria when it was manufactured is available from the factory upon request.



Non-destructive testing²

- REFERENCE** 1. ASTM-F24 Standard On
STANDARD Amusement Rides And Devices
- a. F846-86 Testing Performance Of Amusement Rides
 - b. F853-86 Maintenance Procedures For Amusement Rides And Devices
 - c. F893-87 Inspection Of Amusement Rides And Devices

CHANCE RIDES, INC., at the time of design and manufacture, determines by calculations and testing of a prototype amusement ride the appropriateness for use, of not only the parts, but the entire system of a newly designed ride. These calculations and tests are utilized to, as feasibly as possible, determine the requirements for expected design life of major components. Based on this design criteria, CHANCE RIDES, INC. does not identify critical components on amusement rides to be singled out for non-destructive testing.

If through field experience, there is an indication that a structural or mechanical problem may develop on rides currently operating, CHANCE RIDES, INC. will notify owners by bulletin of the recommended procedures to inspect and correct the possible problem. Any possible defect which could affect the continued safe or proper operation of the ride should be reported immediately to the manufacturer by the owner/operator. This information is necessary so that a determination can be made for either the repair or replacement of the possible defective parts.

Field repairs should not be undertaken without the approval and proper instructions from the manufacturer and should be performed by qualified personnel. These persons should have a complete understanding of both the component's function and the manufacturer's instructions.

It is the responsibility of the individual inspector to thoroughly inspect the ride as he deems necessary based on his knowledge and field experience and manufacturer's recommendations. If the inspector finds an area or component that could be a problem, structural or otherwise, the factory should then be notified. It is then the responsibility of the inspector to ensure that the manufacturer's recommendations for repair, replacement or otherwise have been completed and are in compliance with the required specifications.

Load testing is a destructive form of testing and is not recommended by the manufacturer, as per previous topic "Field performance testing of amusement rides."



Fasteners

Capscrews

Capscrews used by CHANCE RIDES, INC. are classified as functional load-carrying capscrews if:

- They are used as tension members in the erection or operation of the ride and/or
- They are required to resist shear through friction-type connections in the erection or operation of a ride.

Capscrews are selected with consideration to grade, size and quantity, using joint capacities based on tightness torques of 60% rated yield and group joint efficiencies of 62.5%

Torque requirements⁵

Capscrews must be tightened to the torque values listed in the torque chart. These values were selected to produce a tightening torque range of 60% to 70% of proof load, when tightened with a hardened washer under the nut or capscrew head (whichever is accessible for tightening). When the capscrew is tightened from the head end, apply anti-seize lubricant to the shank end of the capscrew. When the threads are lubricated, use 10% less torque to tighten the capscrew.

DO NOT TIGHTEN CAPSCREWS OVER THE RECOMMENDED TORQUE. This can damage the capscrew, due to variances in coefficients of friction and torque wrench accuracy.

Always use a torque wrench. It is impossible to accurately measure the tightness of a capscrew by other methods. Torque wrenches must be checked for accuracy twice each operating season.

Capscrew grades

CHANCE RIDES, INC. uses only grade 5 or better capscrews and grade 8 locknuts, with A325 hardened washers for functional loads. The *Grade markings chart* shows the capscrew markings to be found on CHANCE rides. The manufacturer's identification symbols must be present on all functional load carrying capscrews.



SIZE (DIAMETER) - Threads per Inch	Foot-Pound Torque Range (see Notes 1 and 2) with Locknut and Hardened Washer	
	SAE J429 Grade 5 ASTM A325	SAE J429 Grade 8 ASTM A490
1/4 - 20 1/4 - 28	5-6 6-7	7-8 8-10
5/16 - 18 5/16 - 24	11-13 12-15	15-18 17-21
3/8 - 16 3/8 - 24	19-24 22-27	27-33 31-38
7/16 - 14 7/16 - 20	30-35 35-40	45-55 50-60
1/2 - 13 1/2 - 20	50-60 55-65	65-80 75-90
5/8 - 11 5/8 - 18	95-115 105-130	130-160 150-180
3/4 - 10 3/4 - 16	165-200 185-225	235-285 260-320
7/8 - 9 7/8 - 14	270-325 295-360	380-460 415-505
1 - 8 1 - 12	400-490 440-535	565-690 620-755
1-1/8 - 7 1-1/8 - 12	495-600 555-675	800-975 900-1095
1-1/4 - 7 1-1/4 - 12	700-850 775-940	1135-1380 1255-1525
1-1/2 - 6 1-1/2 - 12	1215-1480 1370-1660	1975-2390 2220-2700
NOTES: 1. Use anti-seize lubricant on capscrew shank when tightened from head end. 2. Use 10% less torque when anti-seize or other lubricant is used on threads. 3. Use same torque range for holes tapped in steel.		

Torque chart

Torques for functional load carrying cold finished hex head capscrews with dry rolled threads, used with locknuts (see note 3), and tightened with an ASTM A325 hardened washer under the capscrew or locknut head (whichever is accessible for tightening).

This torque range will develop 60% to 70% of proof load.













Refer to **Replacement of capscrews and locknuts** for conditions requiring replacement



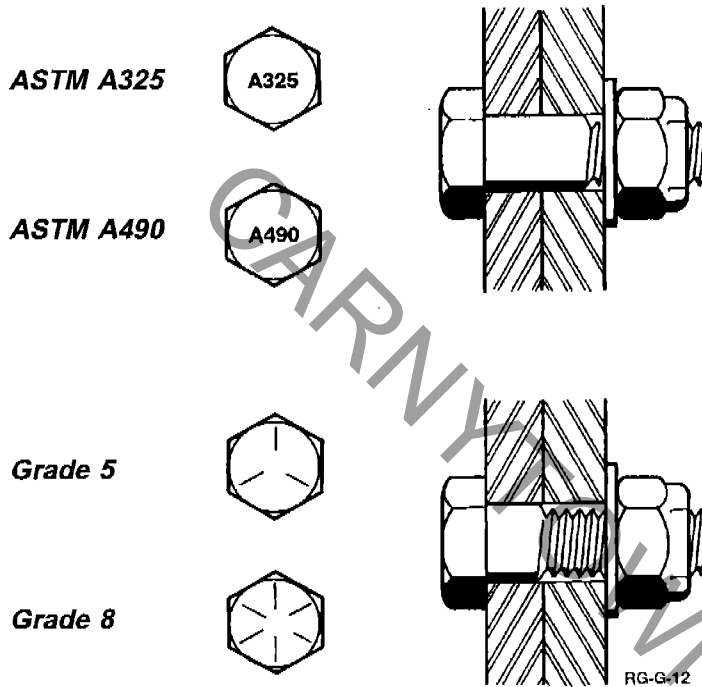
CHANCE RIDES, INC. requires the use of cold-formed hex head capscrews with rolled threads. Hex bolts and hot formed hex head capscrews are not recommended because they may have machined threads and can have die seams along the shank.

NEVER REPLACE CAPSCREWS OR NUTS WITH PARTS OF A LESSER GRADE, OR DIFFERENT LENGTHS THAN THOSE SHOWN IN THE CHANCE PARTS CATALOG.

Grade markings for functional load carrying capscrews
 Manufacturer's identification symbols must be present on all capscrews

Correct markings	Examples of unacceptable markings
SAE J429 Grade 5 Medium carbon 81,000 yield 	  Grade 5.1 Low carbon Grade 5.2 Low carbon martensitic
ASTM A325 Type 1 Medium carbon Longer shank and shorter thread length than Grade 5 81,000 yield 	 ASTM A325 Type 2 Low carbon martensitic 
SAE J429 Grade 8 Medium carbon 130,000 yield 	  ISO R898 Class 8.8 Medium carbon 92,000 yield
ASTM A490 Alloy steel Longer shank and shorter thread length than Grade 8 130,000 yield 	  ISO R898 Class 10.9 Alloy steel 130,000 yield





Capscrew comparison
 ASTM A325 and A490 capscrews have longer shanks and shorter threads than Grade 5 and Grade 8 capscrews of the same size.

Replacement of capscrews and locknuts

When permanently installed capscrews and locknuts are disassembled for repair or adjustment, they must be replaced if they have been in service over five (5) years, or corrosion, or other damage requires over-torquing for removal. If a torque wrench is not used to measure excessive removal torques, the capscrews and locknuts must be replaced.

Capscrews and locknuts which are frequently disassembled for portability must be replaced each operating season. If the capscrews and locknuts become damaged, corroded or require excessive torque for removal, they must be replaced. If a torque wrench is not used to measure excessive removal torques, the capscrews and locknuts must be replaced.

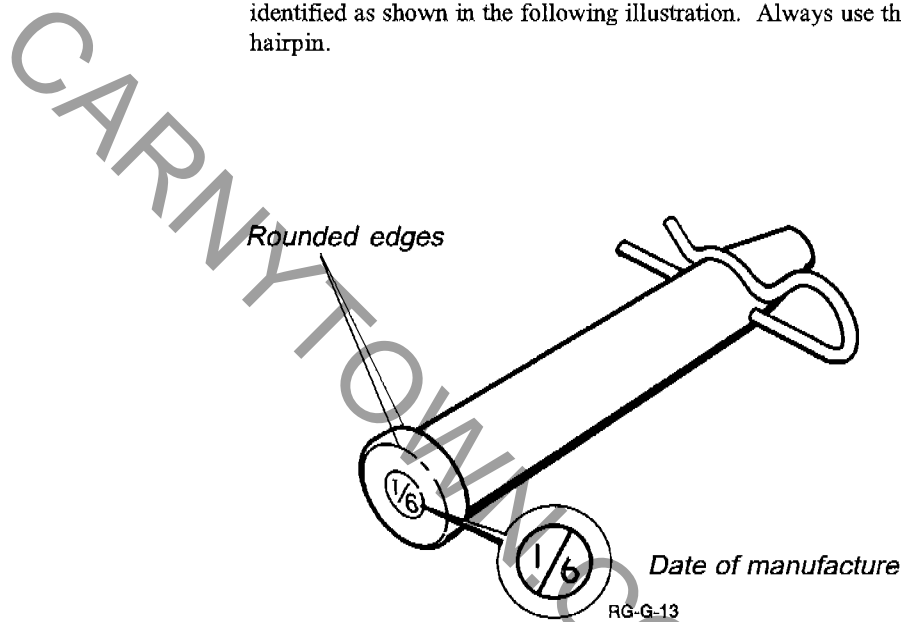


Pins³

Tapered pins used on amusement rides are subject to deterioration due to improper use and wear. CHANCE RIDES, INC. specifies certain pins for certain applications on amusement rides. These pins have been developed over a period of years, taking into account size, design, material and hardness characteristics.

Use only the pins specified by CHANCE RIDES, INC. These pins are identified as shown in the following illustration. Always use the correct hairpin.

Pin identification



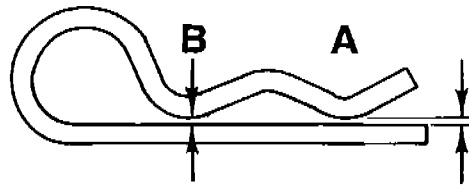
Use care when installing and removing tapered pins. Since these pins are hardened (as are hammers and punches) care must be taken to strike the pin straight on. Striking a pin at an angle can cause the pin to chip, resulting in personal injury. For this reason APPROVED SAFETY GLASSES OR GOGGLES MUST BE WORN AT ALL TIMES when tapered pins are being installed or removed. If a tapered pin is chipped, bent, or “mushroomed” on either end, discard it and replace it with a new pin.

Pin keepers

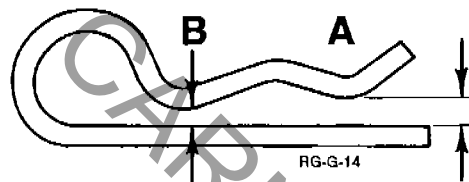
All keepers (R-keys, hair pins, lynch pins, etc.) must be inspected for wear. If a keeper is bent out of shape or “sprung”, it must be replaced.

Hairpins are expendable parts. After repeated use, they become worn and “sprung” as shown.





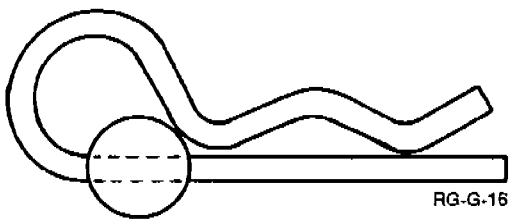
Acceptable hair pins
Dimension "A" equals dimension "B" in a relaxed position



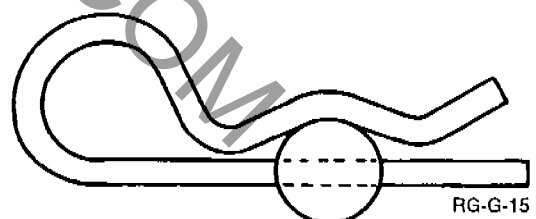
Unacceptable hair pins
Dimension "A" is greater than dimension "B" in a relaxed position

NEVER ATTEMPT TO BEND A HAIR PIN BACK INTO SHAPE.
REPLACE IT WITH A NEW PART.

The correct installation of a hairpin is shown. Incorrectly installed hairpins are more likely to fail, and will distort after only a few uses.

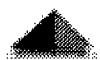


Incorrect



Correct

CHANCE RIDES, INC. recognizes and recommends the safety procedures specified in *ASTM Standards F770 Operation Procedures for Amusement Rides and Devices* and *F853 Maintenance Procedures for Amusement Rides and Devices*.



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General safety guidelines

The following is a list of general safety rules to which everyone should adhere.

1. All work must be performed by competent, qualified mechanics, capable of understanding the function of the parts and their proper installation.
2. Inspect the ride before each day of operation to determine that no portion of the ride is damaged, missing or worn in such a manner that unsafe conditions can develop.
3. Perform the manufacturer's recommended maintenance procedures at the intervals and in the manner specified in the operation and maintenance manual.
4. Study each job carefully to determine all hazards so that necessary safety precautions can be taken.
5. Examine safety devices (tools, ladders, etc.) before used to insure they are in good condition. Use only OSHA approved safety items. Ladders must be clean and unpainted.
6. Use the proper tool or equipment for each job. All hand electric power tools must be properly grounded.
7. Wear close fitting, comfortable clothing when working on or near moving parts or live electrical circuits. Avoid finger rings, jewelry or other articles which can be caught in moving parts or come in contact with electrical circuits.
8. Protect eyes by wearing approved safety glasses or goggles.
9. Wear a hard hat at all times. When working in elevated areas, use a safety belt.
10. Where work performed is hazardous, never work alone.
11. If guards are removed from equipment, make sure they are replaced before leaving the job.
12. Clean up after each job, disposing of surplus materials.
13. Keep a record of parts replaced and the date of replacement. Inform the manufacturer of any replacement requirements which are frequent or cause unsafe conditions.
14. Make modifications and additions only as outlined in manufacturer's service and safety bulletins.

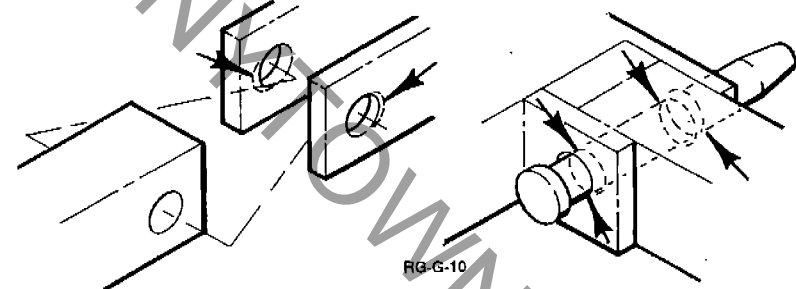


Inspection

Joint inspection

Some joints will appear to wear rapidly on new rides. This is usually a result of the holes not aligning in the mating parts. When this condition occurs it results in "point contact". A joint with this condition will generally wear rapidly until the load is distributed evenly over the fastener and the parts. If in doubt about the condition of a bolt, pin or hole on a new ride consult CHANCE RIDES, INC., and replace as required.

1. Inspect stationary joints for "egg-shaped" wear and loose pins.



Stationary joint wear

Stationary joint-misaligned holes resulting in point contact

2. Inspect moving joints for wear and lubrication.
3. Inspect welded structural joints for cracking or fatiguing.
4. Inspect bolted structural joints for cracking, fatiguing and proper bolt tightness.
5. Inspect pins and keepers on all pin joints for wear and proper installation.
6. Inspect all pins for proper CHANCE identification marks.



Cable inspection

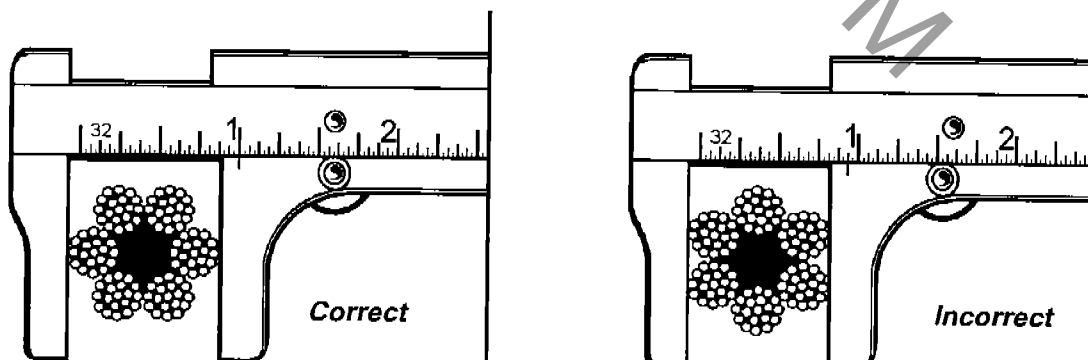
The ride utilizes cables (wire rope) in various locations:

- Tower lift cables (5/8" cables, 8 places)
- Vehicle hanger cables (3/8" cables, 32 places)
- Vehicle hanger link safety cables (3/16" cables, 64 places)
- Vehicle frame safety cables (1/4" cables, 16 places)
- Passenger restraint system release cables (1/8" cables, 32 places)

The following guidelines for cable lubrication and inspection apply to all cables, unless otherwise noted.

Chance Rides, Inc. recognizes that no precise rules can be given to determine the exact life expectancy of any given cable, due to the variables to which that cable may be subjected. Continued use of a cable depends on the judgement of the individual who is authorized by the ride owner to inspect and evaluate the cable.

NOTE: When measuring cable size, the diameter of the cable is the diameter of the smallest circle which will enclose all the strands. Measurement should be made to the outer wires.



Daily Inspection

All cables should be visually inspected daily. The visual inspection consists of observation of all cable and end connections which can reasonably be expected to be in use during daily operation. These visual inspections should be concerned with discovering gross damage which may be an immediate hazard, such as:

- Distortion of the cable such as kinking, crushing or “bird caging”.



Kinking



Crushing



RG-G-2

Bird Caging

- Unstranding, displacement of main strands, or protrusion of the core.
- General corrosion
- Broken or cut strands
- Number, distribution and type of visible broken wires
- Lubrication

NOTE: *Special care must be taken when inspecting portions of the cable which are subjected to rapid deterioration such as end connection points and crossover points.*

When damage is discovered, the cable must be either removed from service or given further inspection as described in the following topic “Detailed Inspection”.



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Detailed Inspection

The frequency of this inspection should be determined by a qualified person, authorized by the ride owner, and should be based on factors including, but not limited to, severity of the operating environment, percentage of capacity lifts, and frequency rates of operation. The interval must not exceed one year. Additionally, the inspection must be performed immediately after any event which could possibly affect the integrity of the cable.

IMPORTANT: *This inspection must be performed on the tower lift cables if the ride has been out of service for a period of one month or more.*

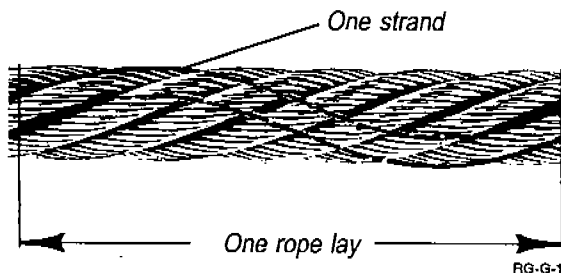
The detailed inspection should cover the entire length of each cable. The individual wires in the strands of the cable should be visible during the inspection. Any deterioration resulting in appreciable loss of original strength, such as described below, require the replacement of the cable.

IMPORTANT: *Cable couplings, splices or other repairs are not permitted on the tower lift cables. Replace the cable with a new part.*

1. **Tower lift cables** - Four randomly distributed broken wires in one lay.
All other cables - Six randomly distributed broken wires in one lay.
2. **Tower lift cables** - Two broken wires in one strand in one lay.
All other cables - Three broken wires in one strand in one lay.

NOTE: *Snagged or nicked wires may be considered as broken wires.*

"Lay" as a unit of measure



3. Abrasion, scrubbing, peening or other wear of one-third the original diameter of outside individual wires.
4. Distortion of the cable such as kinking, crushing or "bird caging".
5. Unstranding, displacement of main strands, or protrusion of the core.
6. Valley breaks - breaks which occur in the valleys between strands indicate some abnormal condition, possibly fatigue and breakage of other wires not readily visible.
7. Severely pitted, corroded or broken wires at end connections.
8. Severely corroded, cracked, bent, worn or improperly applied end connections.
9. Damage due to heat of any kind.
10. Reduction of cable diameter below normal diameter due to loss of core support, internal or external corrosion, or wear of the outside wire.

NOMINAL CABLE DIAMETER	MAXIMUM REDUCTION
5/16" and smaller	1/64"
3/8" to 1/2"	1/32"
9/16" to 3/4"	3/64"
7/8" to 1-1/8"	1/16"
1-1/4" to 1-1/2"	3/32"

The following inspection criteria apply only to the **tower lift cables**:

11. A significant localized increase in the lay length after the cable has broken in.
12. A significant increase in the rate of cable stretch after the original construction stretch has been removed. This can be determined from records showing repeated adjustment of one or more specific cables (See "Tower Lift Cable Adjustment" in this section). This final stretching indicates deterioration of the cable and is accompanied by further reduction in cable diameter and a further increase in lay length.



Tower Lift Cable Sheaves

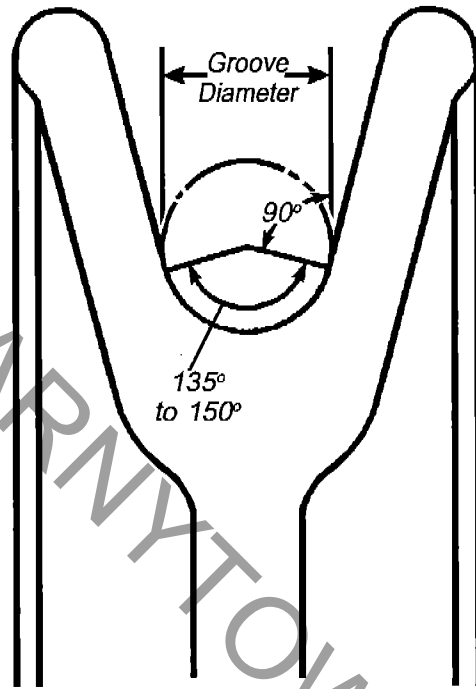
Sheave Inspection

As each tower lift cable runs through the groove in the sheave, both components wear and become smaller. A used sheave can be too small for a new cable, thus accelerating cable wear. A compromise between cable life and machining frequency must be made.

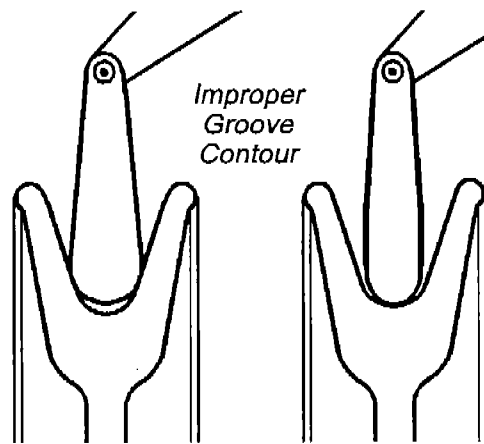
Sheave grooves should have an arc of contact with the cable between 135° and 150°, as shown in the illustration on the following page. The groove should be tapered to permit the cable to enter and leave the groove smoothly. Field inspection groove gauges are available, made to the nominal diameter of the cable, plus 1/2 the allowable cable oversize tolerance. When the field inspection gauge fits perfectly, the groove is at the minimum permissible contour.

When a sheave fails to meet these inspection criteria, it must be either re-machined to the correct contour or replaced with a new part.





Inspection of tower lift cable sheaves



Use of field inspection groove gauge



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Vehicle inspection

NOTE: Each vehicle is equipped with two over-the-shoulder restraint bars, secured by a three-stage locking system

- An electrically operated primary lock
- and**
- A spring-operated mechanical secondary lock
- and**
- A mechanically latched restraint strap

Operation of primary locking system

The passenger restraint system on each vehicle incorporates two hydraulic lock cylinders - one for each restraint bar. The primary locking system operates as follows:

- When the vehicles are on the landing surface and the RESTRAINT BAR SWITCH on the operator's control console is in the "Open" position, a valve on each lock cylinder is electrically opened. This allows the lock cylinder to retract and the restraint bar to be raised.
- When the LAP BAR SWITCH is moved to the "Close" position, the valve is electrically closed. This prevents the lock cylinder from retracting. An internal check valve allows the cylinder to be further extended as the restraint bar is pulled tighter.

Operation of secondary locking system

The passenger restraint system on each vehicle incorporates two spring operated locking mechanisms - one for each restraint bar. The secondary locking system operates as follow:

- The two spring-operated locking mechanisms in each vehicle are connected by linkage to two actuator plungers, one mounted in each landing gear. When the vehicles land, the actuator plungers contact the landing surface, they push on internal linkage, releasing the locking mechanisms.
- When the vehicles are raised and the actuator plungers leave the landing surface, pressure on the linkage is released. This allows both spring-operated locking mechanisms to engage, securing the restraint bars on that vehicle.



Daily inspections

1. Check the operation and locking of every restraint bar daily. Visually check for broken, damaged or missing parts.
2. Inspect both restraint straps on each vehicle daily. Look for:
 - Wear or damage to the belting material
 - Loose, broken or missing fasteners
 - Proper operation of the latch. The latch must operate smoothly and latch securely.
3. Check the operation of the restraint bar interlock system using the procedure described in the following topic, "Passenger Restraint and Interlock System Operational Check".
4. Check the overall condition of each vehicle. Inspection points include, but are not limited to, anti-slip material on the seat floors, lap bar padding and head rests.
5. Inspect all safety placards and signs.

Monthly inspections

6. With the back cover removed, check the primary locking system on EVERY VEHICLE.
 - Inspect the entire primary locking system for loose, missing, worn or damaged components, including the mounting fasteners.
 - Visually inspect each locking cylinder for oil leakage around the seals or physical damage, including the spherical bearings in each end.
 - Energize the solenoid and check for smooth movement of the piston rod in extension and compression.
7. With the back cover removed, check the secondary locking system on EVERY VEHICLE.
 - Visually inspect the entire secondary locking system, including the locking pawls, toothed sectors and springs. Look for any signs of damage, wear or loose fasteners.
 - Inspect the condition of the actuator linkage, cables and other components, including fasteners.
 - Work the actuator levers manually and check the engagement of the locking pawls in the toothed sectors. Both mechanisms must engage and disengage smoothly.



Passenger restraint and interlock system operational check

An interlock system prevents the ride from being started if any of the restraint bars is not down and locked. The following check must be made daily to ensure the proper operation of the passenger restraint interlock system



WARNING: Never load passengers into a vehicle unless ALL passenger restraints on that vehicle are in good working condition, and the passenger restraint interlock system is operating correctly.

Do not tamper with or attempt to defeat the purpose of the passenger restraints or the passenger restraint interlock system. Serious injury to passengers can result.

1. Lower and lock all restraint bars. All restraint bar indicator lights on the operator's control console must be on.
2. Start the ride. It should start and run normally. Stop the ride.



WARNING: When testing the passenger restraint interlock system, use only the ROTATION JOG BUTTON. If the ride starts with the passenger restraint bar unlatched, STOP THE RIDE IMMEDIATELY to avoid serious injury to the passengers.

3. With the ride stopped, manually release ONLY ONE restraint bar on only one vehicle. The restraint bar indicator light for that restraint bar should go out.
4. Close the restraint bar. The indicator light must not come on until the restraint bar is completely down and locked.



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5. If the indicator light comes on before the restraint bar is fully down, adjustment or repair of the passenger restraint bar interlock system is necessary.
6. Proceed to the next vehicle and repeat Steps 3, 4, and 5 until all restraint bars on all vehicles have been tested, ONE AT A TIME.
7. Use the TOWER JOG SWITCH to raise the tower until all vehicles are approximately one foot above the landing surface. This will allow the secondary restraint bar locks to engage.
8. Go back to the first vehicle and pull the manual release plunger for ONLY ONE restraint bar.
9. While pulling the release plunger out, try to raise the restraint bar. The spring operated locking system must prevent the bar from being raised.
10. If the bar can be raised more than 5", adjustment or repair of the spring operated locking system in necessary.
11. Proceed to the next vehicle and repeat Steps 8, 9 and 10 until all restraint bars on all vehicles have been tested, ONE AT A TIME.

Vehicle hanger inspection

1. Inspect for correct installation of vehicle hanger components. A hanger link and cable are required at each attachment shackle.
2. Inspect for installation of correct fasteners. Inspect the condition of all fasteners daily, prior to operation of the ride.



WARNING: Inspect all vehicle hangers, hanger links and cables every day before operation of the ride. Never operate the ride unless ALL vehicle hanger components are in good condition. Serious injury to passengers and/or bystanders can result from vehicle hangers which are worn, damaged, or incorrectly assembled.



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Hub & sweep inspection

1. Check the installation of all sweeps, spreader bars, pins and lynch pins.
2. Inspect all sweeps and spreader bars for cracks, bends and other damage.
3. Check the bolts which attach the sweeps to the hub.
4. Check the bolts which attach the spreader bars to the sweeps.
5. Check the adjustment of the adjustable spreader bar. The spreader bars must be in tension, not compression.

Tower and base inspection

1. Check the tower and base structure for visible cracks or damage.
2. Inspect the tower for proper operation.
3. Visually inspect the welds on the tower and base structure for cracks.
4. Check capscrews that attach the tower to the bearing and those that attach the bearing to the base. These are Grade 8 hex head capscrews with hardened washers under the heads. Verify the hardened washers fit flush to the hub.



Drives and hydraulic system inspection

1. Visually inspect the entire hydraulic system, including hoses, tubes, fittings and other components for leaks.
2. Visually inspect the drive motors for proper operation.
3. Check that the drive gear cover is properly mounted.
4. Inspect all safety placards and signs.

Electrical and lighting inspection

1. Check the operation of all tower limit switches. These switches must be adjusted properly, and **MUST NOT BE BY-PASSED**.
2. Check cable leads, electrical connections and grounding per local code.
3. Test the operator controls, including emergency stop switch, operator presence switch and power switch.
4. Check the electrical jumpers at each vehicle.



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Platform and fence inspection

1. Inspect all platforms, ramps steps and walkways. These areas must be clean and dry. All components must be properly installed.
2. Inspect all fences, gates and queue line chains where applicable. Self-closing gates must operate properly.
3. Inspect all entrance and exit signs.
4. Inspect all safety signs and placards.

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Bibliography

The following service bulletins and manuals are referenced in the preceding text. Service bulletins issued after publication of this guide are located at the back of each section. Any future bulletin releases affecting a ride will be provided by CHANCE RIDES, INC. Bulletins received after receipt of this guide should be considered updates to this guide.

CHANCE RIDES, INC.
 4219 Irving
 P.O. Box 12328
 Wichita, KS 67277-2328

AVIATOR Service Manual
 24000000

The *AVIATOR Service Manual* includes the Operation Manual (#24000001) and the Maintenance Manual

1. *Field Performance Testing Of Amusement Rides*
 B090R1002-0
 May 14, 1986
2. *Non-destructive Testing*
 B090R1022-0
 March 21, 1988
3. *General Safety - Tapered Pins*
 B090R1056-0
 February 9, 1990
4. *Cable Inspection*
 B090R1071-0
 May 25, 1990
5. *Replacement And Torque Requirements For Functional Load Carrying Capscrews*
 B090R1075-0
 May 25, 1990



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6. *Manufacturer's Specifications*
B090R1126-0
March 12, 199

The following Product Improvement Notice is not referenced in the preceding text. The product improvement is not mandatory and may be incorporated at the owner's discretion.

Rust Stain Remover
P090R1179-0
September 22, 1997

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