Tivoli Enterprises Ltd

Howfield Lane, Chartham, Canterbury, Kent CT4 7HG England.
Telephone: 0227 731156

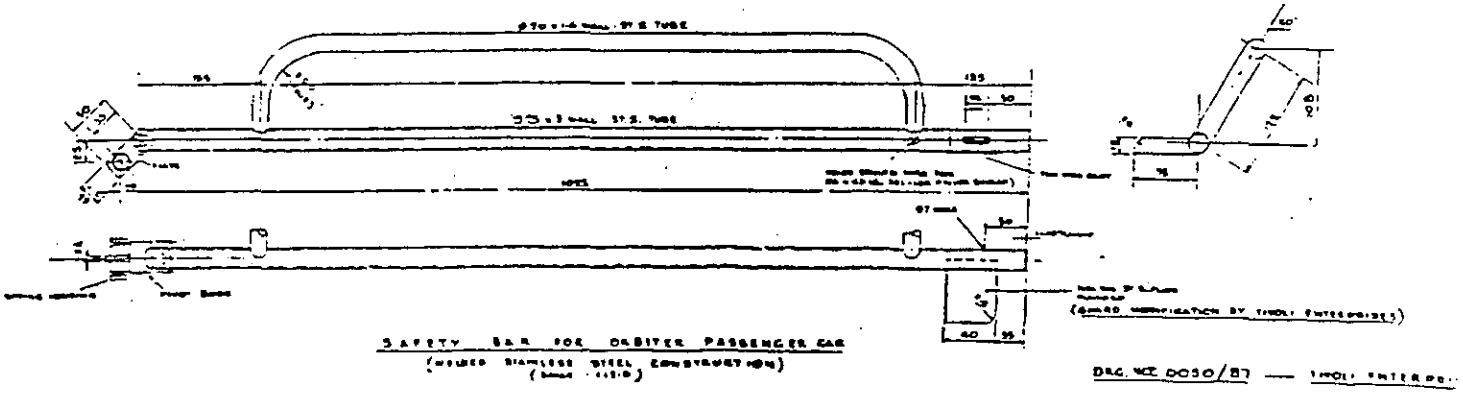
SERVICE BULLETIN

RIDE: Orbiter **DATE:** 4-24-87

SUBJECT: Lap bar release handle cover **BULLETIN NUMBER:** 00102

****

In order to prevent accidental release of lap bar Tivoli recommends the addition of a cover plate to be installed on lap bar as described below. The cover plates are available at no charge from Exsaco Corporation.



SAFETY BAR FOR ORBITER PASSENGER CAR

DRG. NO. 0030/87 — TIVOLI ENTERPRI...

Tivoli Enterprises Ltd

Howfield Lane, Chartham, Canterbury, Kent CT4 7HG England.
Telephone: 0227 731156

NUMBER T0190

DATE February 5, 1990

SERVICE BULLETIN

RIDE Orbiter SERIAL NUMBER All

SUBJECT Staffa B10 Motors

Tivoli Enterprises, Ltd. has been made aware of a problem with the Staffa B10 motors which drive the turrets, where shaft seals have been failing excessively quick. After analyzing and running extensive tests, it has been determined that the oil cooler was creating a back pressure through the drain system in excess of 250 psi. In order to prevent future seal problems, Tivoli Enterprises, Ltd. is offering a hose kit that will reroute the case drain lines from passing through the oil cooler. This kit is available through Exsaco Corporation, One North Santa Fe Street, P.O. Drawer 328, Alvarado, Texas 76009 (817) 783-2265, free of charge, and will only be shipped to customers whose ride is experiencing this problem. Attached are the instructions for the modifications.

To reroute existing hose system (see Figure 1);

1) Remove existing Hose 1 (described by dash dot dot line). Discard.
2) Install "T" fitting (supplied) as described in Figure 1, Part E.
3) Install new Hose B from top of oil cooler to "T" fitting E.
4) Remove Hose 2 from "T" fitting F and plug "T" fitting with plug (C) supplied.
5) Install union D into Hose 2.
6) Attach new Hose A to union D and fit to top of tank port.
7) Attach Hose 2 to supplied bracket.

If you should have any questions or need further assistance, please contact Exsaco Corporation One North Santa Fe Street, P.O. Drawer 328, Alvarado, Texas 76009 (817-783-2265).

Tivoli Enterprises Ltd

Howfield Lane, Chartham, Canterbury, Kent CT4 7HG England.
Telephone: 0227 731156

SAFETY BULLETIN

RIDE: ORBITER DATE: DECEMBER 10, 1990

SUBJECT: CAR ATTACHMENT PINS BULLETIN NUMBER: 00120

****

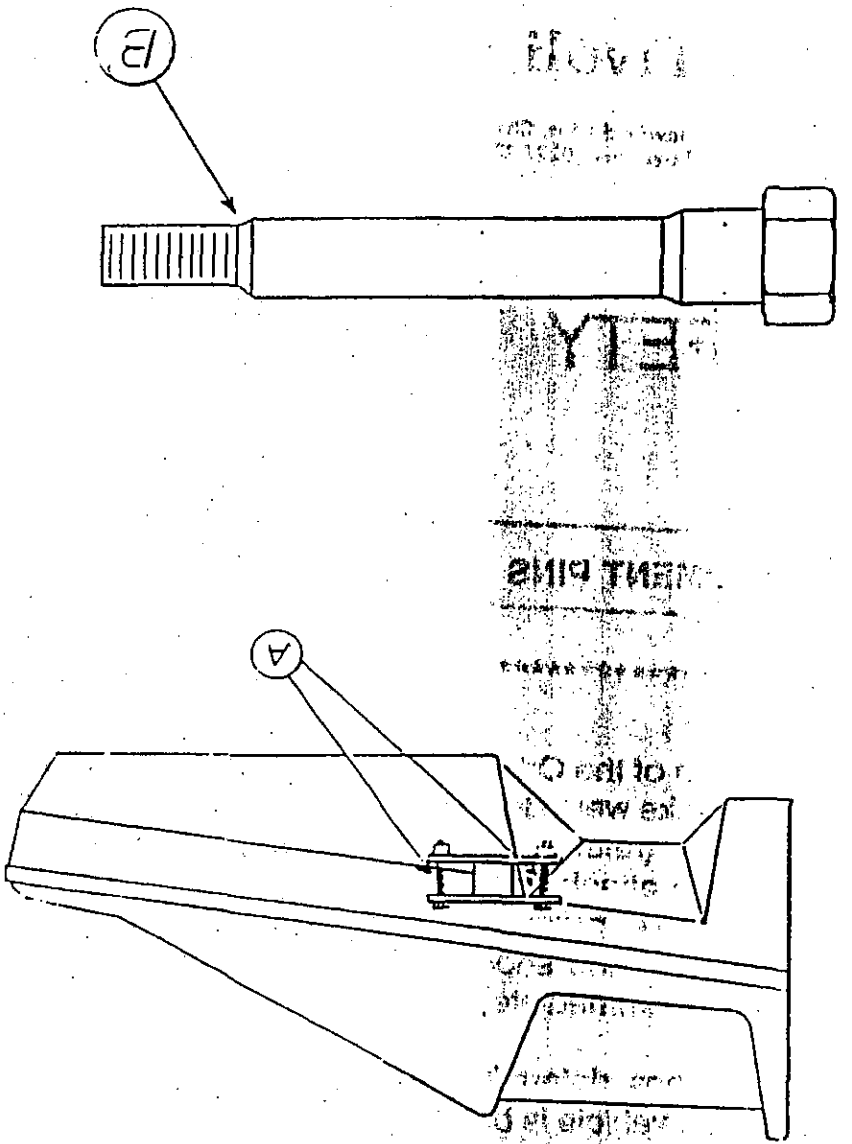
Through routine inspection of the Orbiter Amusement Ride seat attachment pins, (refer to Point A) cracks were detected in the area where the threaded portion meets the pin shaft (refer to Point B). It is recommended by Tivoli Enterprises that these seat attachment pins be inspected by an approved non-destructive testing (NDT) process to determine condition of pins. If cracks are detected, these pins should be replaced immediately. This inspection should be done immediately and then on an annual basis.

After investigation, Tivoli has determined that cracking of pins is due to excessive tightening when vehicle is being attached to sweep. As stated in the manual, these pins should not be tightened in excess of 70 foot pounds. The ride is supplied with an electrical impact wrench which is to be used only to speed the operation of installing and removing these pins. If abused, excessive tightening could damage pins. Use impact wrench to bring pins down until it meets the base metal only.

If it is in owner's or inspector's opinion that use of this impact wrench is being abused by the operator, it is recommended by Tivoli that the electric wrench be replaced with a 3/4" drive ratchet hand wrench.

If there are any further questions, please contact Exsaco Corporation at 817-783-2265.

Tivoli Enterprises, Ltd.


B
A

NAFLIC

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Standards & Related Documents Committee

TECHNICAL BULLETIN - NOVEMBER 1992

041. Woolls (Tivoli) Orbiter

We have been informed of the following potential problem area that may exist on some Orbiters.

The ride motion may be described as having two separate functions, the raising of the centre, and the spinning of the rotating framework. It is necessary to raise the ride before the rotating framework gains more than a very slow speed in order to prevent the passenger carrying cars from digging into the platform of the ride. Conversely, the rotation of the ride at the end of its cycle must have slowed down sufficiently, and all of the six capstan shafts must have fully retracted, before the ride is finally lowered.

The two motions are hydraulically powered, activated by electrical solenoid valves. There are limit switches, located on three of the six capstan shafts, which monitor the retraction of these shafts. There are also two proximity switches which record the level and height of the lift to detect that the ride is at sufficient height for higher speed rotation to be permitted.

Failure in any of the following ways could cause cars to strike the floor :-

1. Failure of any part of the circuits to the three capstans not fitted with limit switches.
2. Failure (such as seizure) of any of the switches fitted to the other three capstans.
3. Failure of the hydraulic circuit controlling rotation in a way which prevents the ride from slowing down, e.g. spool valve sticking (two are in circuit), sticking solenoid valve, or additional feed given wrongly to solenoid valve.
4. Failure of the control system and hydraulic system retracting the capstan shafts.
5. Failure of the lift control spool valve (two are in circuit). An incident of this type is known to have occurred.
6. Failure of either of the proximity sensors on the lift circuit.

We do not claim that the above is an exhaustive list of ways in which failure may lead to cars colliding with the deck.

We draw the attention of Appointed Persons to the fact that serious incidents of this type may have occurred on more than one Orbiter.

PO BOX 752, SUNDERLAND, SR3 1XX
TEL: (0191) 5239498 FAX: (0191) 5239498

Tivoli Enterprises Ltd

Howfield Lane, Chartham, Canterbury, Kent CT4 7HG England.
Telephone: 0227 731158

September 16, 1993

To Whom it May Concern,

This letter is to confirm the proper inspection procedure of the Turret Arm Hinge Pin on the Orbiter Amusement Ride manufactured by Tivoli Enterprises Ltd. Canterbury, England. The inspection procedure indicated in the manual was a misprint. This Pin does not require a annual non destructive test and should be inspected as follows.

These Pins, Located on the top of the turret arm, are to be inspected on a weekly basis for locking plate security and excessive shaft or bushing wear. The locking plates are designed to keep the shaft from moving either in or out, in respect to the bushings and can be turned over for use on the other side in case of plate wear. These plates also keep shaft from tuning on hanging turret frame.

If for any reason during a inspection, the person conducting the inspection determines that improper maintenance procedures have been followed or there is excessive wear (there should be only a very small, less than a quarter inch side to side at bottom of hanging turret) in pin or bushing, the shaft should be removed and inspected for wear. If wear in shaft or pin exceeds .025 inches, it should be replaced. If these pins have not previously been inspected the factory recommends that they be removed and visually inspected for wear approximately every (5) five years.

This letter should be attached to manuals to supercede previous inspections procedure for the hanging arm turret pins.

Best Regards,

Jim Ziala
On Behalf of Tivoli Enterprises Ltd.

Tivoli Enterprises Ltd

Howfield Lane, Chartham, Canterbury, Kent CT4 7HG England..
Telephone: 0227 731166

ON-DESTRUCTIVE TESTING AND SAFETY MODIFICATIONS POLICY FOR TIVOLI, LTD.

All Tivoli manufactured Amusement Rides are designed to the highest degree of safety and quality. Indepth engineering and design analysis has been incorporated into all equipment produced. Tivoli, Ltd. ,therefore, requires no scheduled testing by non-destructive means for the engineered life of the components, unless listed below, issued to customer in the form of a service or safety bulletin, or indicated in Operation Manual.

It should also be understood that this policy is based on the operator/owner exercising proper maintenance and care procedures of all components according to the manufacturers' specifications, along with routine visual inspection of all structural components for any unusual circumstances. Any unusual circumstance must be reported to the manufacturer immediately.

In the event that a fault or potential safety problem is discovered through our own testing or field experience requiring an annual test or modification, information concerning these tests or modifications will be made available immediately to the owner of the equipment.

Below are listed all current safety service bulletins or equipment modification bulletins.

BULLETIN NUMBER	RIDE	CONCERNING	EFFECTIVE DATE
00102	ORBITER	LAP BAR	APRIL 24,1987
00120	ORBITER	CAR ATTACHMENT PINS	DEC, 10, 1990

Tivoli Mfg. Ltd.

Howfield Lane, Chartham, Canterbury, Kent, England
Tel: (1227) 731156 Fax: (1227) 731137

Safety Bulletin

Bulletin No: ORSA002
Ride Type: Orbiter
(Orbiter aka. Typhoon, Predator)
Date: February 27, 2004

Page: 1 of 4
Rides included: All Rides
Pages: 4
Parts supplied: If requested

This bulletin supersedes Safety bulletin ORSA001

Purpose: **Inspection of top center hub area.**

On February 1, 2004 an Orbiter amusement ride caught fire while operating at a fair in West Palm Beach, Florida. The fire originated in the top center hub area of the ride. A fire was initiated when bolts securing the motor mounting plate became loose and over a long period of time eventually sheared allowing the motor plate to turn causing one or more hydraulic hoses to pull loose from their crimp, spraying fluid into the top hub area. An electrical short presumably ignited this oil. The source of ignition is still under investigation at this time. As a precaution Tivoli Mfg. Ltd. requires that the inspection recommendations described below be carried out as soon as possible on all Orbiter rides in operation.

- Inspection of B10 hydraulic motor pinion mountings. The pinions on the orbiter are attached in one of two ways, a bolt and washer screwed into the end of the output shaft or two allen set screws threaded into the top shoulder of the pinion gear. These fasteners are to be checked for tightness and assured that they are properly secured with loc-tite (242). Note: If applying loc-tite the threaded areas must be free of grease or oil before installing.

- Inspect all bolts securing motors to mounting plate.
  - 5 – 12 mm x 45mm bolts for each hydraulic motor.

  If loose, damaged or show signs of reuse, replace immediately with new bolts and tighten to correct torque.

- Replace all nine (9) bolts securing motors mounting plate to hub.

Post-it® Fax Note 7671	Date	# of pages ▶
To Andy Lichte	From Ron Cooke	
Co./Dept.	Co. Cookes Hamilton Shows	
Phone #	Phone # 201-288-3560	
Fax #	Fax #	

- 9 – 12mm x 45mm bolts spread equal distance around outside parameter of plate. See Attached drawing ORSA002A.

Bolt Specification, three motors and motor mounting plate.

Bolt: Hex head, 12 mm x 45 mm x 1.75, grade 8.8, partial thread, black finish. Ref: DIN 931 / ISO4014

Washers: 12 mm, flat hardened washers, 13 mm ID, 24 mm OD, 3 mm thick. C45. Ref: DIN 6916

Tightening Torque Requirements: Tighten bolts to 65 ft / lbs.

- Inspect all wiring in top center area and repair any loose or broken wires. Assure a sweep wiring is free and clear of entanglements with hydraulic hoses. Check all wiring connections on slip rings and flasher enclosures.
- Clean area of oil and debris.
- Inspect hydraulic hoses and fittings, replace any hoses found to be damaged or worn repair any leaks.
- Inspect slip ring assembly and assure proper alignment.
- Assure all top aluminum tread plate covers are in place on the top of the ride.
- Install 10 lbs. ABC fire extinguisher in control booth that is easily accessible by operator.
- Train personnel in proper fire and evacuation procedures.
  - Instruct operators that in case of fire press **"stop ride"** button. This will bring the ride down to a normal stop. Due not use "Ride Abort" button, as this will stop ride with the center in the raised position making it more difficult to evacuate passengers.
  - Evacuate all passengers before attempting to extinguish the fire.
  - If conditions warrant proceed to extinguish fire with fire extinguisher.
  - Notify Fire department immediately.

Inspection Requirements:

Inspection of motor mounting plate to detect any damage, missing, or visibly loose bolts. Loose or frayed wiring, damaged slip ring assembly, must be made as part of normal

routine inspections of the top area of the ride. Bolts securing the motor mounting plate must be tested for tightness every Six (6) months of operation.

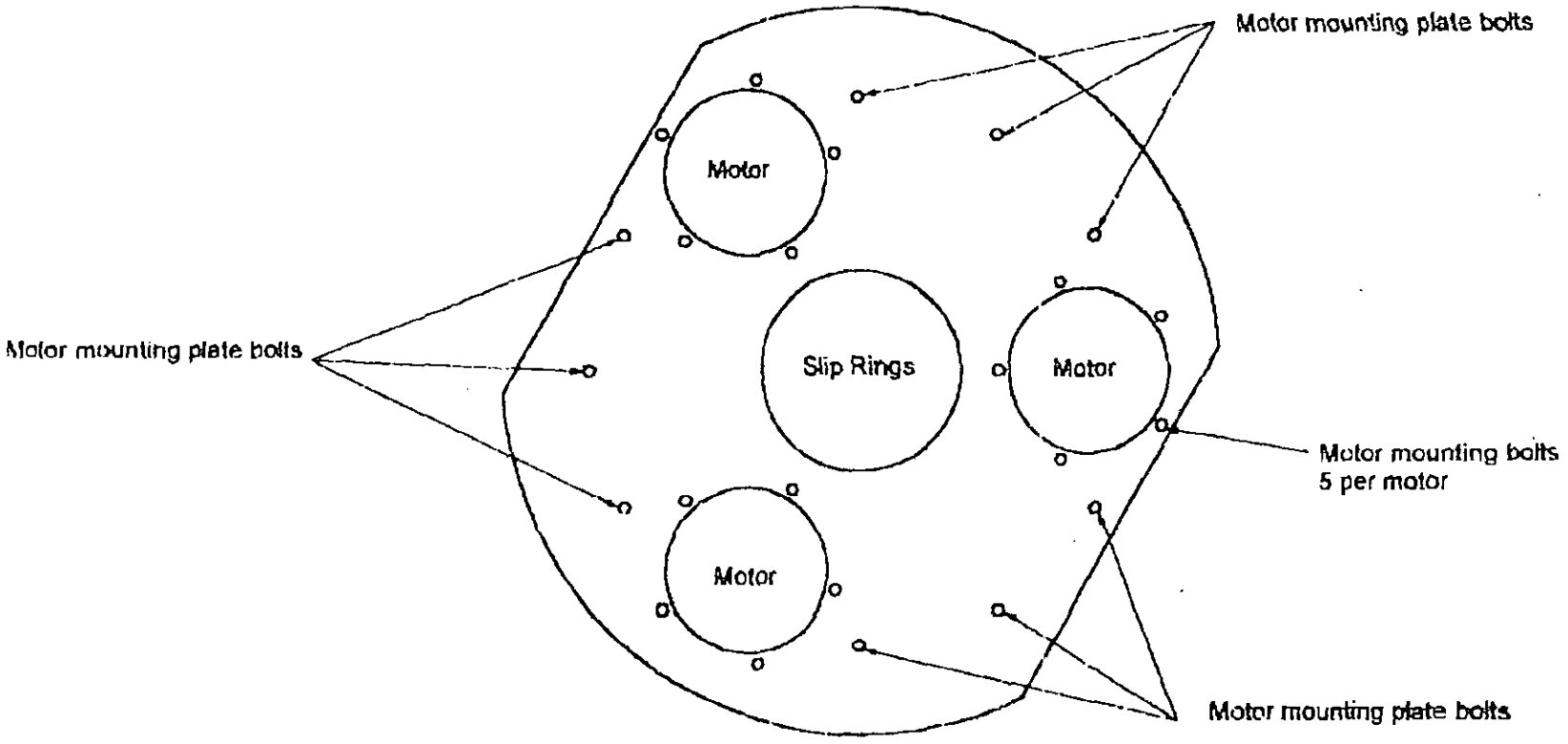
If all the above inspections and instructions are completed, all components are in correct working order and all normal routine inspections are completed as described in the operators manual the ride will be ready for operation.

Tivoli is in the process of developing a guard that can be placed around the slip ring assembly in order to help reduce its exposure to the elements. These will be made available as soon as have been produced and shipped to the U.S. Please contact AmTech (817-641-5045) for availability.

Tivoli Mfg. Ltd.

Orbiter center sweep motor mounting plate.

Report: ORSA002 Page 4 of 4



Motor mounting plate bolts 9 pcs.

Motor mounting bolts 5 bolts per motor, 3 motors.

Drawing: ORSA002A

Tivoli Mfg.Ltd

Safety Bulletin

TIVOLI MFG. LTD.

Bulletin No: ORSA002A Pages: **4**
Ride Type: Orbiter (aka Typhoon, Predator) **Rides Included: All Rides**

Date: March 30, 2004 **Parts supplied:** Yes

This Safety Bulletin is being issued in cooperation with the U.S. Consumer Product Safety Commission who will monitor its implementation and effectiveness. It supersedes AmTech safety bulletins ORSA001 and ORSA002.

(NOTE: Changes in inspection procedure and parts availability)

Purpose: Inspection of top center hub area.

On February 1, 2004, an Orbiter amusement ride caught fire while operating at a fair in West Palm Beach, Florida. The fire originated in the top center hub area of the ride. A fire was initiated when bolts securing the motor mounting plate became loose and eventually sheared allowing the motor plate to turn causing one or more hydraulic hoses to pull loose from their crimps, spraying fluid into the top hub area. The source of ignition is still under investigation at this time. As a precaution Tivoli Mfg. Ltd. requires that the inspection recommendations described below be carried out **immediately** on all Orbiter rides.

It is absolutely necessary that all testing, inspections, and work be done by professional personnel capable of understanding the function of the components and who are trained in the uses of the equipment necessary to complete the work described in this bulletin.

- **Inspection of B10 hydraulic motor pinion mountings.** The pinions on the orbiter are attached in one of two ways; 1) a bolt and washer screwed into the end of the output shaft or; 2) two allen set screws threaded into the top shoulder of the pinion gear. These fasteners are to be checked for tightness and assured that they are properly secured with Loc-Tite® (242). **Note: If applying Loc-Tite®, the threaded areas must be free of grease or oil before installing.**

- **Inspect all bolts securing motors to mounting plate.**
  - 5 – 12 mm x 45mm bolts for each hydraulic motor.

If loose, damaged or show signs of re-use, replace immediately with new bolts and tighten to correct torque.

- **Replace all nine (9) bolts securing motors mounting plate to hub.**
    - 9 – 12mm x 45mm bolts spread equal distance around outside parameter of plate. See Attached drawing ORSA002A (See Attached)

Bolt Specification for three motors and motor mounting plate.

Bolt: Hex head, 12 mm x 45 mm x 1.75, grade 8.8, partial thread, black finish. Ref: DIN 931 / ISO4014

Washers: 12 mm, flat hardened washers, 13 mm ID, 24 mm OD, 3 mm thick. C45. Ref: DIN 6916

Tightening Torque Requirements: Tighten bolts to 65 ft-lbs.

- Inspect all wiring in top center area and repair any loose or broken wires. Assure sweep wiring is free and clear of entanglements with hydraulic hoses. Check all wiring connections on slip rings and flasher enclosures.
- Clean area of oil and debris.
- Inspect hydraulic hoses and fittings, replace any hoses found to be damaged or worn; repair any leaks.
- Inspect slip ring assembly and assure proper alignment.
- Assure all top aluminum tread plate covers are in place and fastened on the top of the ride.
- Install a 10 lb ABC fire extinguisher in control booth that is easily accessible by operator.
- Train personnel in proper fire and evacuation procedures.
    - Instruct operators that in case of fire press **"STOP RIDE"** button to bring the ride down to a normal stop. Do not use **"Ride Abort"** button, as this will stop ride with the center in the raised position making it more difficult to evacuate passengers.
    - Evacuate all passengers before attempting to extinguish the fire.
    - If conditions warrant proceed to extinguish fire with fire extinguisher.

- Notify Fire department immediately.

Inspection Requirements:

Routine inspections of the top area of the ride must include inspection of the motor mounting plate to detect any damage, missing, or visibly loose bolts, loose or frayed wiring, or damaged slip ring assembly. Bolts securing the motor mounting plate must be tested for tightness **every six (6) months** of operation.

Bolt Testing procedure:

In order to test and assure motor mounting bolts have remained tight to their recommended torque value the following procedure must be followed;

- Obtain a torque wrench (or equivalent) capable of attaining a tightening torque between 0 and 100 ft-lbs. **Important:** Assure the torque wrench is in good working order and is properly calibrated.
- Use a 19mm socket with wrench.
- Set torque for 60 ft-lbs. **Do not set over this value.**
- Using torque wrench attempt to tighten each bolt until the torque wrench indicates (clicks) 60 ft-lbs.
- As the bolt is tightened visually check socket for rotation.
    - The socket should not turn before the indication (click) is reached. This will indicate that the bolt is remaining at its correct torque. **If each bolt passes this test there is no further testing required**
    - If the socket turns before the indication (click) is reached, the bolt has loosened and both bolt and washer must be replaced.
        - If loose bolts are detected notify Tivoli Mfg. Ltd. or AmTech in order to determine if further testing or investigation is necessary.

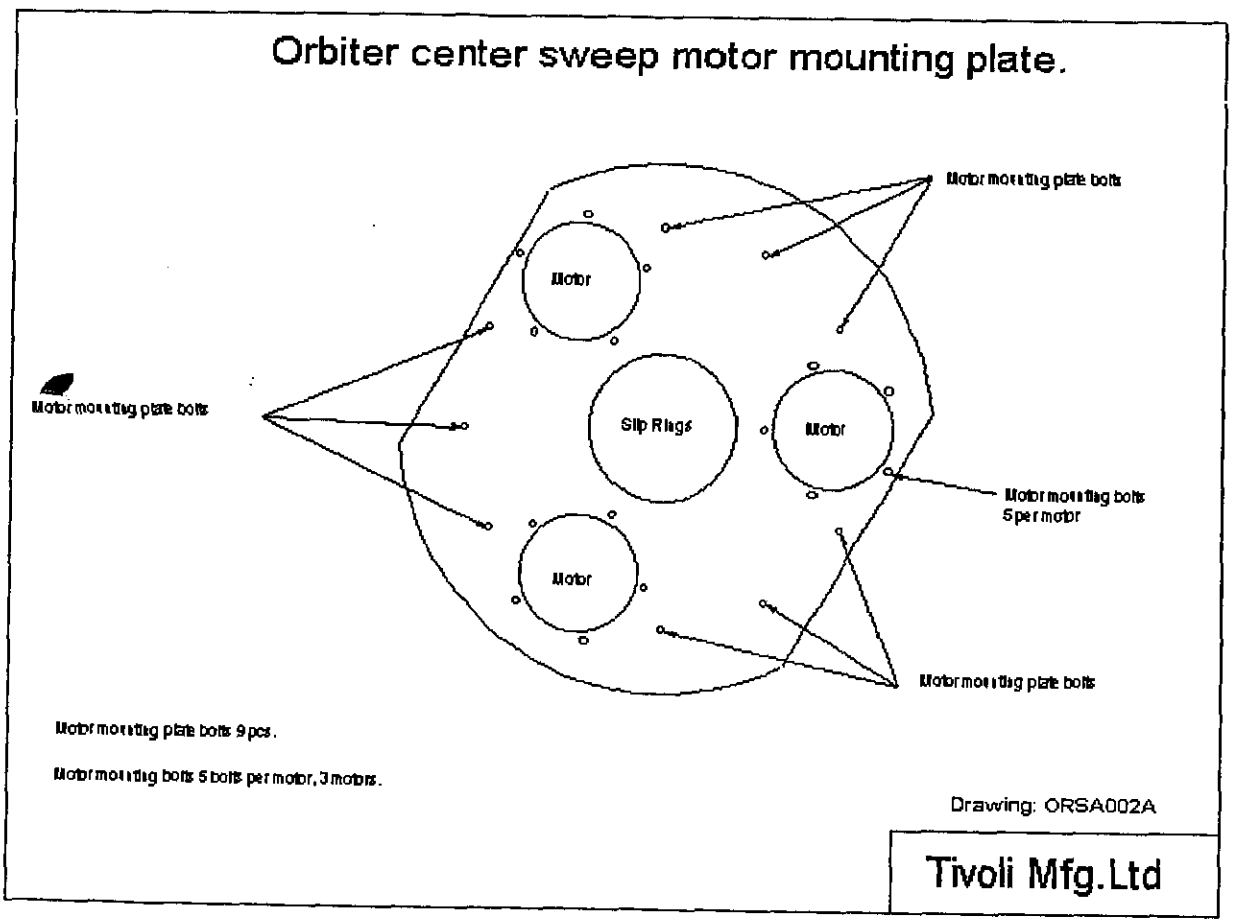
Replacement motor mounting plate bolts and washers (9 bolts and 9 washers) manufactured to the above specifications are available free of charge, freight paid (UPS ground only). Faster service available at cost.

Contact: AmTech at 817-641-5045 or Fax: 817-645-9109. Please have ride serial number available when ordering.

Tivoli has developed a guard that can be placed around the slip ring assembly in order to help reduce its exposure to the elements. These will be made available in approximately 6 weeks. Please contact Jim Ziaja at AmTech (817-641-5045) for availability.

The ride will be ready for operation when all the above are inspected, certified, documented and completed in accordance with the manufacturer's instructions. The ride owner/operator will be responsible for maintaining written records of all ride inspections and parts replacements.

If there are any questions or additional information required in order to complete what has been outlined in this bulletin please contact Tivoli Mfg. Ltd or AmTech/ Amusement Technologies Intl. Inc. (817-641-5045).



Tivoli MFG. Ltd.

Tivoli Mfg. Ltd.

Howfield Lane, Chartham, Canterbury, Kent, England
Tel: (1227) 731156 Fax: (1227) 731137

Safety Bulletin

Bulletin No: ORSA003
Ride Type: Orbiter
(Orbiter aka. Typhoon, Predator)
Date: December 10, 2004

Page: 1
Rides Included: All Rides
Pages: 1

Purpose: **Installation of slip ring protective cover.**

On February 1, 2004 an Orbiter amusement ride caught fire while operating at a fair in West Palm Beach, Florida. The fire originated in the top center hub area of the ride. The fire was a result of a mechanical failure that caused a hydraulic leak, which was ignited. The source of ignition is still under investigation at this time. As a precaution, to reduce the possibility of a fire caused by electrical arcing around the slip ring assembly Tivoli Mfg. Ltd. requires that a cover be installed.

The Slip ring cover (guard) is available free of charge if ordered within 60 days of date of issuance of this bulletin from AmTech / Amusement Technologies Intl. Inc. After 60 days the guards must be purchased at the current sales price. There will be a service charge of $50.00 to cover costs of shipping, handling, and administrative costs.

Please order the slip ring cover as follows.

Part No.
Order from: AmTech / Amusement Technologies Intl. Inc
3306 N. Main St. Cleburne TX 76033
Tel: 817-641-5045
Fax: 817-645-9109
E-Mail: e-mail@amtechintl.com

If you have any questions please contact AmTech / Amusement Technologies Intl. Inc.

Tivoli MFG Ltd.

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Standards & Related documents Committee

TECHNICAL BULLETIN – MAY 2006

309. ORBITOR RESTRAINT BAR CRACKING

We have been informed by an ADIPS Registered IB - Mick Barker - of defects or cracks that have been found in the restraint bars of two Orbitor devices.

On the first device, out of the 18 bars, 9 of them had visible defects or cracks, and after NDT was carried out it was found that 17 in total had defect indications. One of the original visible defects was some 65mm long.

The second device was also subjected to NDT and found to have similar problems with 16 out of the 18 bars showing defects, however he is not stating if on this device any of the defects were visible.

We would like to remind both Inspection Bodies and Controllers carrying out inspections that all restraint bars should undergo regular thorough examination using both visual and NDT methods.

It is also important to advise that a **careful visual inspection** of any such critical areas should be carried out as a **normal part of daily inspection**, and that this is the responsibility of the controller.

Committee Members :- Doug Dadswell (Chairman), Richard Barnes, Peter Smith,
Ian Grant, Mr Dave Inman, Phil Mitchell, John Green, Ron Dale
PO BOX 752, SUNDERLAND, SR3 1XX TEL & FAX: (0191) 5239498 standards@naflic.org.uk

Tivoli Mfg. Ltd.

Howfield Lane, Chartham, Canterbury, Kent, England
Tel: (1227) 731156 Fax: (1227) 731137

Safety Bulletin

Bulletin No: ORSA004
Ride Type: Orbiter (Sand Storm)

Rides Included: Rides manufactured prior to 1980
Pages: 2

Date: May 22, 2006

Purpose: NDT of Orbiter vehicle connection frame.

On May 5, 2006 an Orbiter passenger vehicle detached from its connection frame during operation injuring two persons. This particular ride was manufactured utilizing a vehicle connection frame only manufactured prior to 1980. **All rides manufactured after this date used a different vehicle attachment system and are not included in the NDT testing requirements outlined in this bulletin.**

Tivoli Mfg. Ltd, however highly recommends that all Orbiter owners inspect all vehicle frame work for signs of corrosion on a yearly basis

The cause of the separation of the vehicle was caused by a combination of corrosion and cracking of the welded tubing at the weld joint of the attachment frame as indicated in the accompanying drawing.

Tivoli requires that the welded connection and tubing in the area noted in the drawing be tested by magnetic particle NDT testing and visually checked for corrosion. Any additional testing or change in procedure will be at the discretion of the testing technician.

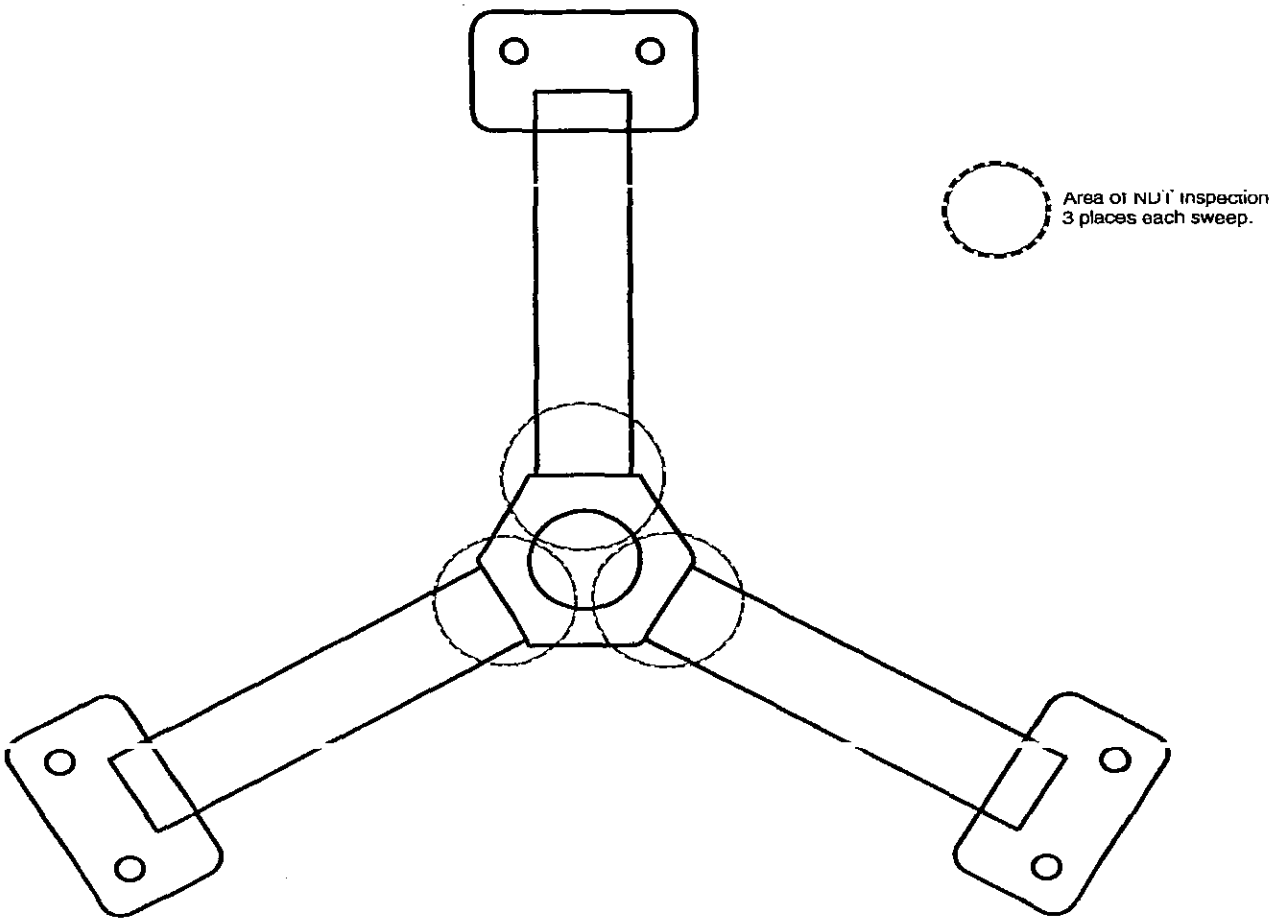
Report and irregularities to Tivoli Mfg. Ltd or its Representative for proper repair procedures.

If you have any questions please contact AmTech / Amusement Technologies Intl. Inc. at 817-641-5045

Tivoli MFG Ltd.

Tivoli Mfg. Ltd.

Howfield Lane, Chartham, Canterbury, Kent, England
Tel: (1227) 731156 Fax: (1227) 731137



Vehicle Connection Frame

ACTION NOTE

TIVOLI ORBITER EXTREME

Following the passenger ejection from a Tivoli Orbiter Extreme in Scotland in May 2009 an investigation has been conducted by HSE. A concurrent examination of the ride and the possible causes of the ejection was conducted by the Health and Safety Laboratory (HSL) in Buxton. This report has now been received by HSE and action is required by the operators to prevent a recurrence of the ejection incident.

Problem:

The rides affected are all Tivoli manufactured Orbiter Extreme rides with seat and rail configurations as shown below:

Fig 1:

Experiments on the ride involved with this seat configuration have shown that it is possible, given the movement characteristics of the ride and the rail positioning, for ejection to occur through the gaps in the containment. The gap in the containment marked A in Fig 1 (165mm) corresponds to the chest depth of 14-year-old boy, whose equivalent stature (with shoes) is estimated at 1750mm. The gap marked B in Fig 1 (239mm) is large enough for all children 16 years of age and under, and 17% of all adults to fit through and so possibly be ejected from the ride through this route, especially during the start up phase. In order to eliminate the risk of ejection through this gap, an estimated height restriction closer to 1950mm would be more appropriate (i.e. to eliminate all but large adults).

Action required:

Action required is in 2 stages:

1. Until physical changes are made to the seat restraint bars and those changes have been reviewed and approved in accordance with the design review procedures in HSG 175, with immediate effect, no person under the height of 1.8m (one point eight metres) is to be permitted to ride this machine. The design review should be carried out by an appropriately qualified person and can be limited to the seat restraint bar system if that is the only part altered. It should be noted that there remains a slight possibility that persons of certain builds over 1.8m may still be ejected from the ride so a high level of operator vigilance is required.

2. By 21 August 2009 the seat rails must be adjusted so that the gap between the overhead restraint and the new rail is not greater than 50mm and should fill the gap from top to bottom as shown in Fig 2. The 50mm measurement is to be taken with the overhead restraint at the 'first click' only and not utilising the pneumatic system. Tivoli have completed this work on at least one ride so far, an example of this work is below:

Fig 2:

It can be seen that the original side restraint bars are retained and the new piece welded to it. This addition should be capable of withstanding the weight of the upper torso of a large male rider, an approximate sideways force of 150 kg during all phases of the ride.

Operators are to notify HSE, (M Sandell – 07527002689) when this work has been completed. Operators who have not notified HSE by 21 August 2009 will be visited by their local HSE NFIT Inspector to discuss future use of the ride.

Once this work is done the ride can once again be operated allowing riders of at least 1.3m to ride.

HSE Action:

HSE NFIT inspectors will be briefed to pay particular attention to the use of these rides, in particular the height restraint procedures used by operators, and enforce as necessary.

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National Association For Leisure Industry Certification

Standards & Related Documents Committee

TECHNICAL BULLETIN — JUNE 2008

335. Orbitor NDT Schedule

The committee has received the following NDT Schedule from the HSE. This NDT Schedule only applies to the device discussed in the document. It should not be used for any other Orbitor ride. However, it can be used as a guide for writing NDT Schedules for Orbitor type rides.

Further guidance on NDT schedules in general will be given in a future bulletin.

HSE NDT Inspection Schedule For The 'Orbiter' Fairground Ride.

	NAME (PRINT)	SIGNATURE	POSITION	DATE
Prepared by:	T. J. Armitt.		NDT Level 3	30 April 2007
Reviewed by:	Dr. S. Joel.			

1. **Scope:** The purpose of this NDT inspection schedule is to standardise all inspections conducted on the 'Orbiter' rides manufactured by Tivoli Manufacturing Limited, Kent.
   This document has been produced for the Health and Safety Executive and the purpose of it is to provide a baseline to allow comparison of existing NDT schedules held by ride controllers to determine the adequacy of their existing inspections.

2. **Contents:** This inspection schedule is divided into sections;

   Section A: Retaining bolts and surrounding material attaching the seat modules to the three legged spider fabrication.
   Section B: Welded fabrication attaching the three legs to the hub assembly.
   Section C: Articulating arm connecting pins and hydraulic ram mountings.
   Section D: Central rotating tower.
   Section E: Chair assemblies.
   Section F: General Visual Assessment of Structural Integrity
   Section G: General safety checks
   Section H: Reporting
   Section I: Responsibility

3. **Ride Owner:** It is the responsibility of the ride owner/controller to ensure compliance with current safety legislation including ensuring that suitable non destructive testing (such as is required by this schedule) is carried out on their ride.

4. **Personnel:** All persons conducting NDT in the form of UT, MT, PT or ET shall hold current certification to EN473 level 2 in the method of test. The British certification scheme PCN complies with the requirements of EN473 and PCN certificates will be acceptable evidence of NDT operator qualification.
   Persons conducting the structural assessments visually shall be familiar with inspection of fairground equipment and experienced in visual inspection of in service structures.
   All persons conducting NDT on this type of ride should be registered with ADIPS for the type of inspection they are carrying out.

5. **Terms and definitions used in this schedule:**

   NDT or Non-destructive testing; This includes use of recognised methods such as ultrasonic testing (UT), magnetic particle testing (MT), liquid penetrant testing (PT) and eddy current testing (ET).

Critical inspection points; These are specific locations that require use of non-destructive testing methods and techniques to be applied to detect any evidence of deterioration structurally or mechanically that could adversely affect the safe operation and use of the ride. The Non-destructive methods are specified in the following photographs.

Structural assessment points; This covers the general welded structure of the ride concentrating on changes in material thickness and welded joints including connection to the trailer chassis assembly and also includes engineering fit up between bolted and pinned assemblies.

General safety checks; This covers daily visual and physical inspection of hand rails, safety guards, seat restraint mechanisms and integrity of electrical fittings and insulation.

6. **Standards**; The following standards shall be used as reference documents in connection with this NDT schedule:

   BS EN ISO 9934-1: 2001 Non-destructive testing – Magnetic Particle Testing – Part 1, General principles.

   BSEN 473: 2000 Non-destructive testing - Qualification and certification of NDT personnel - General principles.

   BS EN 571-1: 1997 Non-destructive testing – Penetrant Testing – Part 1, General principles.

   BS EN 10228-3: 1998 Non-destructive testing of steel forgings – Part 3, Ultrasonic testing of ferritic and martensitic steel forgings.

   BS EN 1711: 2000: Non-destructive examination of welds – Eddy current examination of welds by complex plane analysis.

   BS EN 13814:2004 Fairground and amusement park machinery and structures – Safety.

7. **Procedures**; Companies providing an inspection service in the form of UT, MT, PT and ET shall work to an NDT procedure approved by a person certified to EN473 (PCN) NDT level 3 in the method of test. The procedure shall be formulated from the appropriate standard referenced in this schedule. A specifically designed technique sheet shall accompany any general NDT procedures to address individual areas of test application unique to this design of ride. The technique sheet shall also be approved by the NDT level 3.
   Note: This requirement is common practice in the NDT service inspection industry.

Critical Inspection Points

The following locations around the ride assembly shall be inspected on an annual basis by a certified NDT operator using the specified NDT methods and concentrating on critical locations highlighted in this section.

A. Retaining bolts and surrounding material attaching the seat modules to the three legged spider fabrication.

Fig 1: General view of the seat retaining bolt in position on the ride.

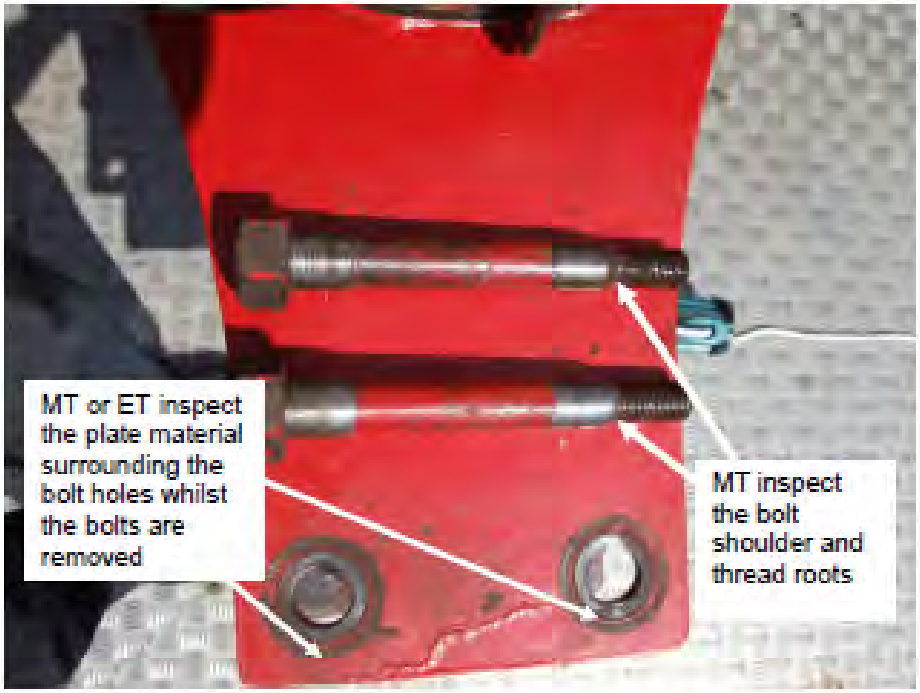

Fig 2: View looking down on the seat attachment arm with the seat assembly removed.

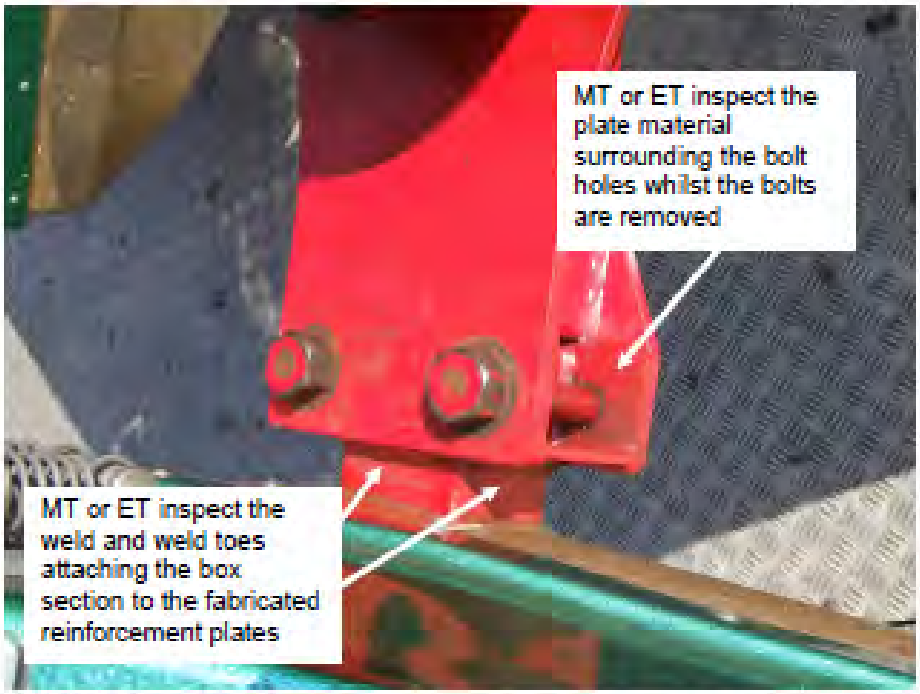

Fig 3: View from above the seat attachment bolts with seat in position.

B. Welded fabrication attaching the three legs to the slew ring assembly (later design).

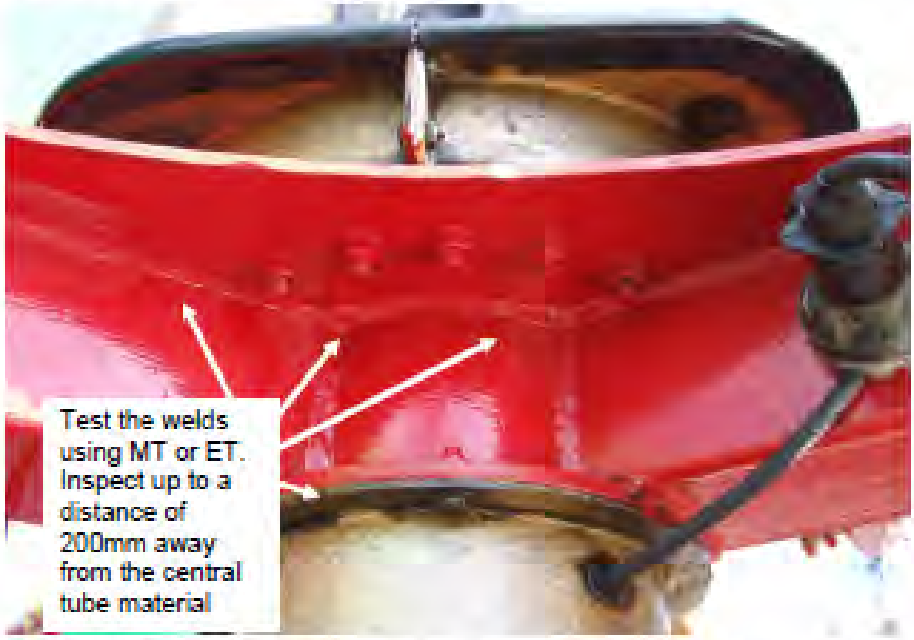

Fig 4: View of the welded fabrication attaching the three legs holding the seat assemblies to the slew ring (later design).

Note: This later design is reinforced by adding a profile cut plate fully welded across the top edge of all three box section legs.

C: Articulating arm connecting pins and hydraulic ram mountings.

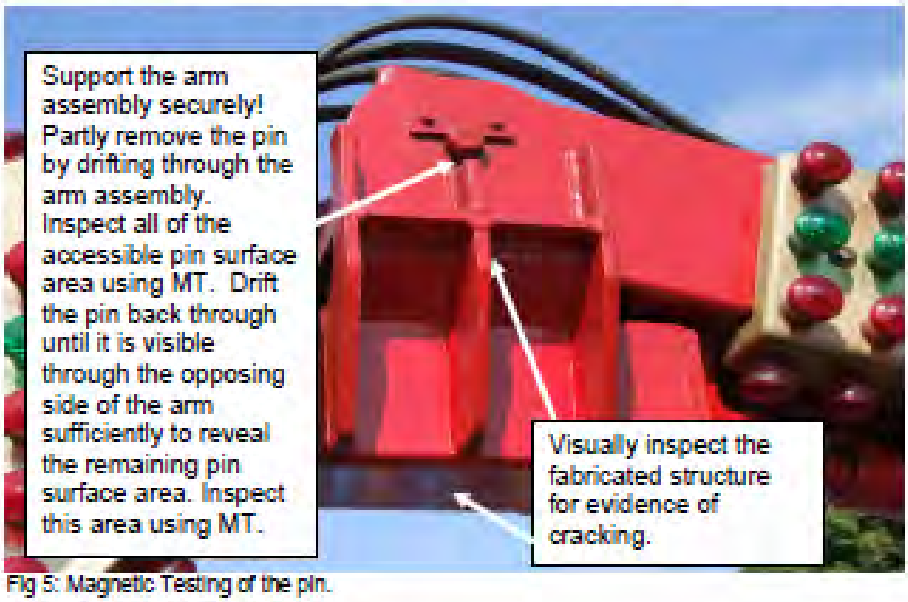

Fig 5: Magnetic Testing of the pin.

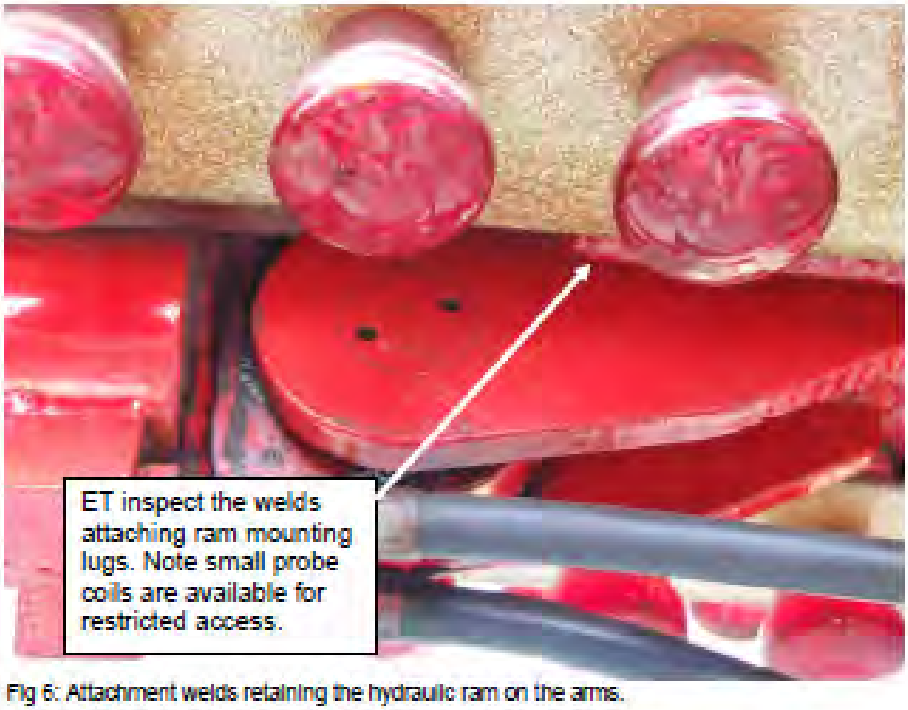

Fig 6: Attachment welds retaining the hydraulic ram on the arms.

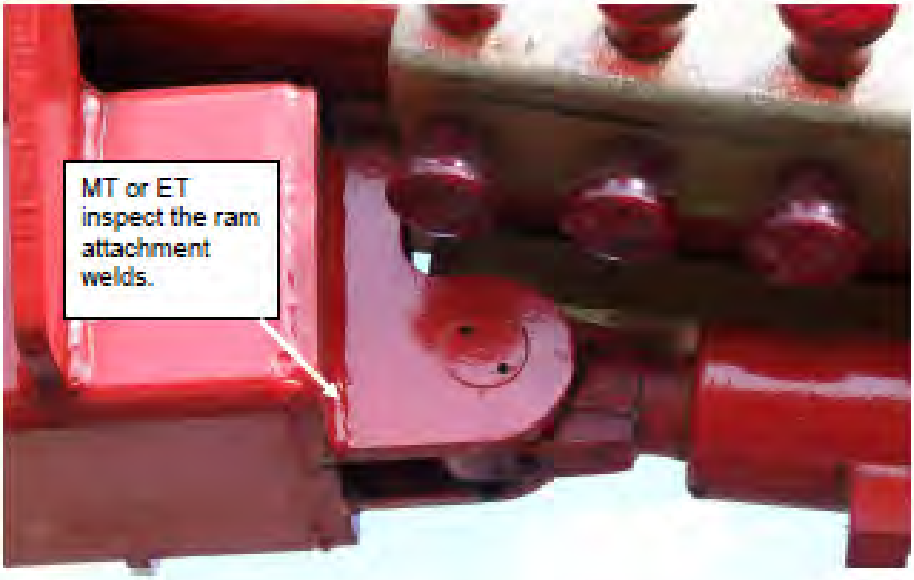

Fig 7: Welded brackets holding the hydraulic ram on the arm assembly.

D: Central rotating tower.

Fig: 8 Intersection of the arm assembly to the central tower fabrication.

Fig 9: Retaining pins that prevent the arms folding.

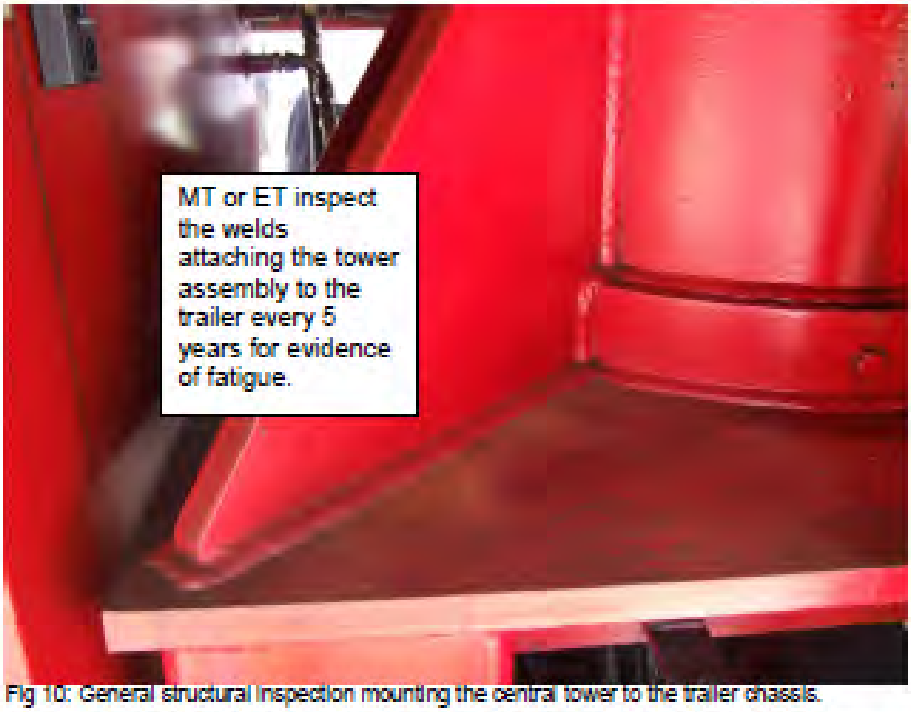

Fig 10: General structural inspection mounting the central tower to the trailer chassis.

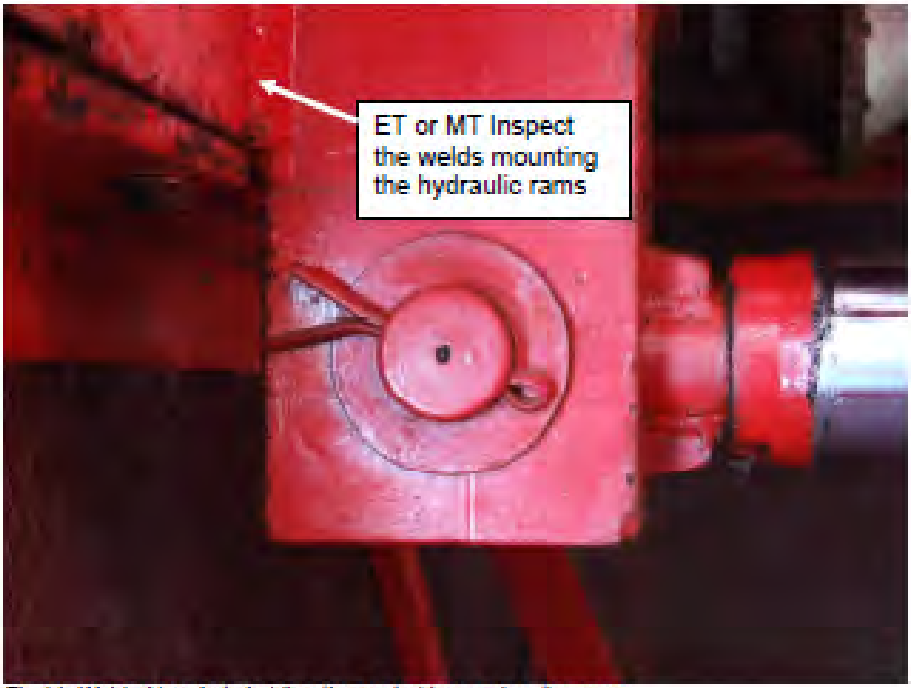

Fig 11: Welded brackets holding the central tower elevation rams.

E: Chair assemblies.

Fig 12: View of a chair assembly with lower fairing removed to gain access to the structure.

Fig 13: Passenger restraint bars fabricated from stainless steel.

F: General Visual Assessment of Structural Assessment Points

The general structural integrity of all components of the ride shall be visually inspected annually by an ADIPS Registered Ride Examiner.

G: General Safety Checks

The responsibility for daily inspection of structural and mechanical components is with the ride operator. Before use each day a series of functional tests shall be run. This shall be followed by a visual inspection of the general structure.

The passenger restraining bar closure mechanism shall be checked for secure operation before use on a daily basis.

H: Reporting

All inspections completed by competent inspectors including specialist NDT operators shall include an end report. The formal report shall identify the following information as a minimum:

1. Ride owner
2. Location of the ride at the time of inspection
3. Date of inspection
4. Components inspected
5. Procedures used during the inspection
6. Calibration records of NDT equipment used
7. Name of inspector or NDT operator
8. Copy of professional and NDT qualifications and certificates
9. Annual vision acuity certificate
10. Results of the test
11. Details of any evidence of cracking
12. Detail of who is the recipient of the report
13. Recommendations and general observations requiring attention
14. Signature of the person who completed the inspection

The NDT report shall be scrutinised by the registered inspection body. The inspection body needs to assess the implications of the NDT report in terms of the overall integrity of the device and make necessary recommendations for further work and, if necessary, retest.

I: Responsibility

It is the responsibility of the ride owner and operator to fulfil regular inspections to ensure the safe working operation of ride equipment.
This schedule is for guidance and is produced as minimum inspection criteria. Additional inspection frequencies and details to be tested are at the discretion of the competent inspection persons and the ride owner.

Schedule Number: LINDT051006
NDT schedule for the 'Orbiter' ride.

This schedule is not intended as an exhaustive document to cover all aspects of the ride but is to be used as a considered focal document to address regions of mechanical and structural risk at the time of writing.
Any additional risk assessments can be added to this document in the future in the form of document revisions.

End of document.