Health and Safety Executive

Safe Passenger Containment on Pinfari Mini Dragon Coasters

◆SIM 5/2002/16

Target Audience:

All HSE Inspectors with fairgrounds responsibility

Date issued: 2003-02-17	**OG Status:** Partially Open
Review date: 2007-02-17	**Author Unit/Section:** Entertainment Section

SUMMARY

This SIM provides options for the improvement of passenger containment systems on the above ride.

BACKGROUND

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ENQUIRIES

11 Enquiries about this SIM should be made to the Food and Entertainment Sector, Entertainment Section at the Glasgow office. Tel (VPN) 521 3045 email Area 21, FOD Entertainment Section.

[1] Exemption 4	Law enforcement and legal proceedings
[2] Exemption 12	Privacy of an individual

Date first issued: 17 February 2003

APPENDIX 1
(paras 5, 9 and 10)

DRAFT LETTER FOR DISTRIBUTION TO PINFARI DRAGON COASTER OWNERS

Dear Sir/madam

HEALTH & SAFETY AT WORK ETC. ACT 1974

I understand that you currently own a Pinfari Mini-Dragon Coaster.

The purpose of writing is to bring to your attention information which resulted from an investigation into the death of an eight year old child from a Pinfari Mini-Dragon Coaster towards the end of September 1999.

The Health and Safety Executive (HSE) investigation has highlighted potential problems with the design and maintenance of the current lap bar, and in the ride safety management system. With this in mind we are asking you to carry out a review of your lap bar maintenance regime and your safe system of work for the operation of the ride. As a result of this reassessment you may need to consider a combination of physical improvements to the lap bar, and changes to your safety management system.

The way in which controllers operate their ride will vary according to the location and specifics of the individual operator. For this reason, while HSE is seeking a consistent response to the problems above, we appreciate that there may be individual variations in the results of the reassessment, and any actions required.

Accordingly we have identified a range of potential solutions (appended to this letter) which you may choose to adopt according to individual circumstances. The list is not exclusive and you are free to choose any other equally effective measures.

Would you please reply to me within 28 days outlining the action you intend to take with respect to your mini dragon coaster. If however the ride is no longer operational, or you have sold it, I would be most grateful if you advise me of the current owner of the coaster or when it ceased to be in operation.

Please contact me if you need further help.

Yours sincerely

AN OTHER
HM INSPECTOR OF HEALTH AND SAFETY

Guidance on POTENTIAL SOLUTIONS for Pinfari Mini Dragon Coasters

To ensure safe containment of passengers, controllers need to utilise a mix of good safety management practices and either lap bar modifications in combination with a maintenance regime that is in line with this guidance to ensure that the original design specification for the amount of free play in the lap bar is not exceeded. Where an allowance is made for wear in the mechanism, this allowance should be assessed by a competent designer.

It is not feasible to accurately estimate a child's age but it is possible, by using height limits, to identify those under a given age. In deciding on control measures controllers need to recognise that children do not behave as small adults and that children are capable of carrying out actions that, to an average rational adult, would seem strange. In making these decisions controllers need to focus on the objective of preventing passengers, especially those in vulnerable groups such as children, inadvertently moving into positions of danger. The following list gives a range of options that controllers might consider when deciding on the risk reduction methods required for their dragon coasters.

Hardware modifications

Consideration should be given to modifying the lap bar to minimise the risk of a passenger falling from the car. The aim should be to either reduce the gap between the lap bar and the passenger or to ensure that it is not possible for the restraint bars to move forward of the side of the car seat at the entrance side. This could be achieved in a number of ways:

- redesign of the lap bar gearbox (this has already been carried out on one existing Dragon Coaster) to reduce excessive free play in the mechanism when the bar is locked;
- increase the length of the horizontal part of the lap bar such that it projects beyond the edge of the seat (ie there is no space between the lap bar and the side of the seat that would enable a person to fall through);
- consider the need to further control the risk of ejection of passengers if they choose to kneel on the seat (eg by increasing the height of the sides and back of the seat, by other changes to containment, by improving seat surface friction, by attention to track surface anomalies etc;
- fitting of foam rolls to the horizontal part of the lap bar so that it will not be possible for users, who meet the height restriction, to slip between the bar and the side of the car; and
- fit extra inertia reel seat belts or similar to the existing device to further ensure that people do not inadvertently move into positions of danger.

If the last two options are selected, it is vital that excessive free play in the lap bar is reduced. Care should be exercised when carrying out modifications to ensure that additional hazards, eg trapping points, are not created.

Where safety critical modifications are made to the device, the design specification and written risk assessment (including ergonomics of passenger containment, etc,

as appropriate) should be prepared by a competent designer. In accordance with HSG175, safety-critical modifications should be subjected to design review, assessment of conformity to design and initial test. Only once this has been completed can the ride be used after any such modification.

Safety management systems

Regardless of whether any modifications to the lap bar are required, it is essential that the improvements are matched by modifications to the safety management system used on the rides to ensure that it is effective. Experience has shown that amusement devices fitted with full restraint systems can fail if the safety management system is not adequate. The following list gives a number of options to consider when reviewing the ride safety management system:

- the use of height restrictions will enable controllers to identify those who need special attention. **This is not used to stop such individuals from riding but rather to identify the special measures that might be required to ensure their safety**. Such measures might include restrictions on where a person should sit if unaccompanied. In this case the person would only be allowed on the inside seat away from the entrance;

- the use of height limits (these would be lower than any height restriction) to prevent those who are not capable of riding the device on their own from doing so;

- those who fall within the height range outlined above can use the device if accompanied by a responsible adult. In this case, the role of the adult is simply to prevent the child from moving into a position of danger;

- use of verbal warning to riders telling them to stay seated within the device and not to move from it whilst the device is in motion;

- use of safety signs at key points, eg queuing points, pay box. Signs to be pictorial or in very simple English;

- selection of operators and attendants as per HSG 175;

- proper supervision of operators and attendants;

- sufficient training of operators and attendants. Operators and attendants should ensure that riders are not mismatched in size so that the lap bar is effective for both riders. A known source of risk on communal lap bars is where a large person is sat next to a small person meaning that the lap bar fits the large person leaving the smaller person free to move into a position of danger. If it is not possible to match riders, then the smaller one must sit in the inner seat;

- training in emergency procedures including prevention of rowdy individuals accessing the ride and giving instructions to people who are seen to be starting to misbehave on the ride;

- operators and attendants should also be encouraged to report near misses and other types of behaviour that should lead to risk assessments being reviewed;
- as for all amusement devices, operating patterns need to be designed to ensure that operators and attendants do not become fatigued.

Conclusions

The above list is not exhaustive and controllers are free to adopt other equally effective measures. It is clear that no one hardware or management solution will in all cases reduce the risks to acceptable levels in the Pinfari Mini Dragon Coaster. For this reason, where changes are needed, it is likely that a combination of the above options will be required.

APPENDIX 2
(para 9)

OPTIONS FOR IMPROVEMENT OF MINI DRAGON COASTER SAFETY

Guidance on POTENTIAL SOLUTIONS for Pinfari Mini Dragon Coasters

1 To ensure safe containment of passengers, especially primary school children, controllers need to adopt utilise a mix of good safety management practices and either lap bar modifications in combination with or the introduction of a maintenance regime that is in line with this guidance to ensure that the original design specification for the amount of free play in the lap bar is not exceeded. Where an allowance is made for wear in the mechanism, this allowance should be assessed by a competent designer.

2 It is not feasible to accurately estimate a child's age but it is possible, by using height limits, to identify those under that a given age. In deciding on control measures controllers need to recognise that children do not behave as small adults and that children are capable of carrying out actions that, to an average rational adult, would seem strange. In making these decisions controllers need to focus on the objective of preventing passengers, especially those in vulnerable groups such as children, inadvertently moving into positions of danger. The following list gives a range of options that controllers might consider when deciding on the risk reduction methods required for their dragon coasters.

Hardware modifications to lap bar design

3 Consideration should be given to modifying the lap bar to minimise the risk of a passenger falling from the car. The aim should be either a reduction in the gap between the lap bar and the passenger or to ensure at the very least that it should not be possible for the restraint bars to move forward of the side of the car seat at the entrance side. This could be achieved in a number of ways:

- redesign of the lap bar gearbox (this has already been carried out on one existing Dragon Coaster) to reduce excessive free play in the mechanism when the bar is locked;

- increase the length of the horizontal part of the lap bar such that it projects beyond the edge of the seat (ie there is no space between the lap bar and the side of the seat that would enable a person to fall through);

- consider the need to further control the risk of ejection of passengers if they choose to kneel on the seat (eg by increasing the height of the sides and back of the seat, by other changes to containment, by improving seat surface friction, by attention to track surface anomalies etc;

- fitting of foam rolls to the horizontal part of the lap bar so that it will not be possible for users, who meet the height restriction, to slip between the bar and the side of the car; and

- fit extra inertia reel seat belts or similar to the existing device to further ensure that people do not inadvertently move into positions of danger.

4 If the last two options are selected it is vital that the excessive free play in the lap bar is reduced and is maintained at the original Pinfari specification. Care should be exercised when carrying out modifications to ensure that additional hazards, eg trapping points, are not created.

Where safety critical modifications are made to the device, the design specification and written risk assessment (including ergonomics of passenger containment, etc, as appropriate) should be prepared by a competent designer. In accordance with HSG175, safety-critical modifications should be subjected to design review, assessment of conformity to design and initial test. Only once this has been completed can the ride be used after any such modification.

Safety management systems

5 Regardless of whether any the type of modifications to the lap bar are required, it is essential that the improvements are matched by modifications to the safety management system used on the rides to ensure that it is effective. Experience has shown that amusement devices fitted with full restraint systems can fail if the safety management system is not adequate. The following list gives a number of options to consider when reviewing for improving the ride safety management system.

- the use of height restrictions will enable controllers to identify those who need special attention. When used in this way the height of the potential rider will identify children of primary school age. **This is not used to stop such individuals from riding but rather to identify the special measures that might be required to ensure their safety**. Such measures might include restrictions on where a person should sit if unaccompanied. In this case the person would only be allowed on the inside seat away from the entrance;

- the use of height limits (these would be lower than any height restriction) to prevent those who are not capable of riding the device on their own, from doing so;

- those who fall within the height range outlined above between the height restriction and the height limit for unaccompanied riding can use the device if accompanied by a responsible adult. In this case, the role of the adult is simply to prevent the child from moving into a position of danger;

- use of verbal warning to riders telling them to stay seated within the device and not to move from it whilst the device is in motion;

- use of safety signs at key points, eg queuing points, pay box. Signs to be pictorial or in very simple English;

- selection of operators and attendants as per HSG 175;

- proper supervision of operators and attendants;

- sufficient training of operators and attendants. Operators and attendants should ensure that riders are not mismatched in size so that the lap bar is effective for both riders. A known source of risk on communal lap bars is where a large person is sat

next to a small person meaning that the lap bar fits the large person leaving the smaller person free to move into a position of danger. If it is not possible to match riders, then the smaller one must sit in the inner seat (away from the entrance);

- training in emergency procedures including prevention of rowdy individuals accessing the ride and giving instructions to people who are seen to be starting to misbehave on the ride;

- operators and attendants should also be encouraged to report near misses and other types of behaviour that should lead to risk assessments being reviewed;

- as for all amusement devices, operating patterns need to be designed to ensure that operators and attendants do not become fatigued.

Conclusions

The above list is not exhaustive and controllers are free to adopt other equally effective measures. It is clear that no one hardware or management solution will, in all cases, reduce the risks to acceptable levels in the Pinfari Mini Dragon Coaster. For this reason, where changes are needed, it is likely that a combination of the above options will be required.

APPENDIX 3
(para 9)

LIST OF KNOWN PINFARI DRAGON COASTER OWNERS

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This list is not thought to be exhaustive and inspectors are asked to advise any errors or omissions to the Sector.[2]