humanIMPACTengineering
injury prevention through analysis, testing and design

18 August 2011

Our Ref: W11-005 & W11-006

Glenn Mitchell – Advantage Sulky's
c/o Gary Kairn
Harness Racing Australia
Level 1, 400 Epsom Road
Flemington VIC 3031

Dear Gary,

RE: ADVANTAGE SULKY WHEEL TESTING

Human Impact Engineering has completed testing of the two sulky wheels supplied by Advantage Sulky's (see picture above).

Testing included the following according to the Australian Harness Racing **Sulky Wheel Approval Policy:**

- a static lateral strength test,
- a dynamic fatigue test,
- dimensional requirements, and
- marking requirements.

One wheel (ID #W11-006) was subjected to a static lateral load strength test on 17 August 2011. It met the approval criteria. The second wheel (ID #W11-005) was subjected to a dynamic fatigue test on 17 August 2011. It met the approval criteria.

The approval criteria for wheels for use in harness racing in Australia is to have similar strength and fatigue properties to the steel rimmed and spoked traditional wheels currently used in and proven appropriate for Australian racing conditions. The approval criteria, based on the spoked steel wheels, are a lateral strength of at least 1000 N and a fatigue life of 40,000 cycles at a lateral load of at least 420 N.

Approved wheels must incorporate a tamper proof and externally visible display of date of manufacture, manufacturer, wheel model, material and a unique serial number (to be reported to Harness Racing Australia for approval). Currently your wheels do not meet this requirement as the wheel model and material is not marked.

Test conditions for the wheels and details of the wheels performance are provided in the attached report. Please do not hesitate to contact us if you require further information or wish to discuss your wheels.

Best regards,

Tom Gibson BE MSc PhD CPEng
Director

Dasun Abey BE Mech (Biomed) (Hons)
Test Engineer

HUMAN IMPACT ENGINEERING is a registered trading name of Forster & Gibson Pty Ltd
ABN 79 079 040 789 / ACN 079 040 789
Unit 3/36 Albert Street, St. Peters NSW 2044 Australia
PHONE +61 2 9557 0933 FAX +61 2 9557 0096
EMAIL enquiries@humanimpacteng.com WEB http://www.humanimpacteng.com

WHEEL TEST SUMMARY

Wheel ID:	W11-005 & W11-006
Wheel Model:	Not Provided
Manufacturer:	Advantage
Date of manufacture:	2011
Serial No:	010 & 010
Material:	Aluminium
Safety Disc:	Fitted
Wheel diameter:	700mm
Tyre Width:	33 mm
Wheel Weight:	5.4 kg

Test 1: Static lateral load test

Test 1 was to determine the stiffness and the lateral strength of the wheel, Figure 1. With the wheel hub secured, the wheel rim was laterally loaded until a significant structural failure occurred. A load cell was used to measure the lateral load and a dial gauge was used to measure the corresponding lateral deflection of the wheel.

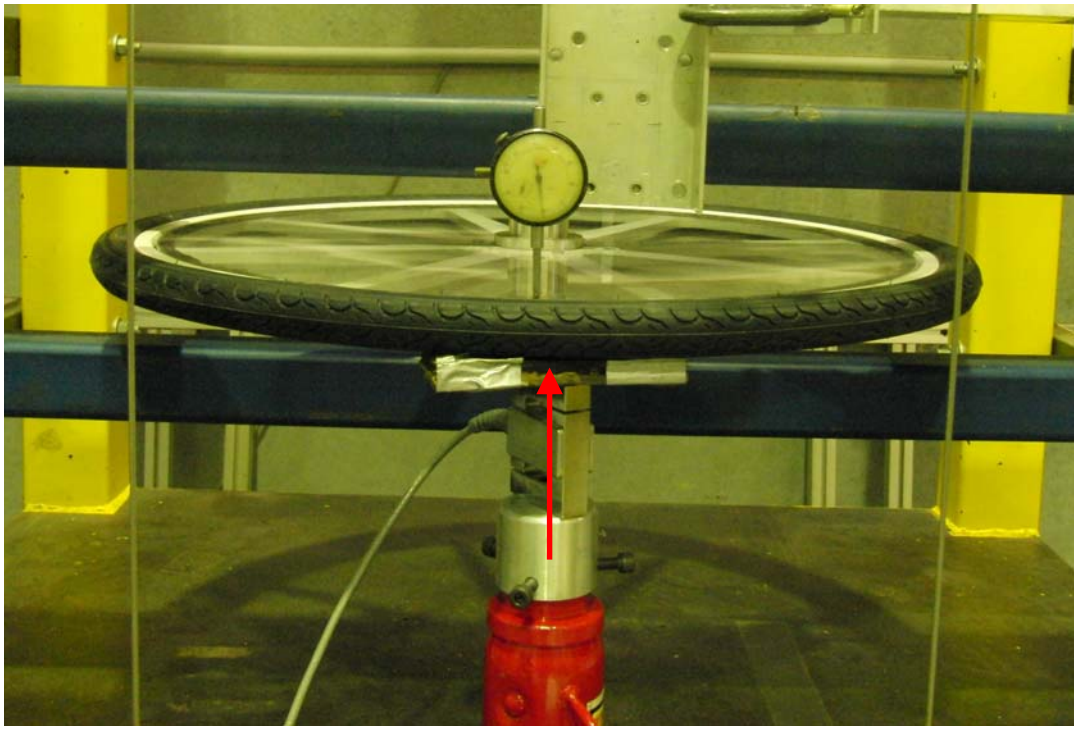

Figure 1 Static lateral load test. Arrow depicts load application direction (see also Figure 2).

In Test 1 your wheel (ID #W11-006) reached a load of 3081N. At this point there was no visible sign of failure and testing was stopped. The deflection of the wheel at the maximum applied load is shown in Figure 2. Upon inspection, the wheel showed no sign of structural failures of the spokes, hub or safety disc. The wheel retained very little residual deflection after removal from the test rig, see Figure 3. There was no visibly significant structural failure of the wheel under the loading conditions of Test 1.

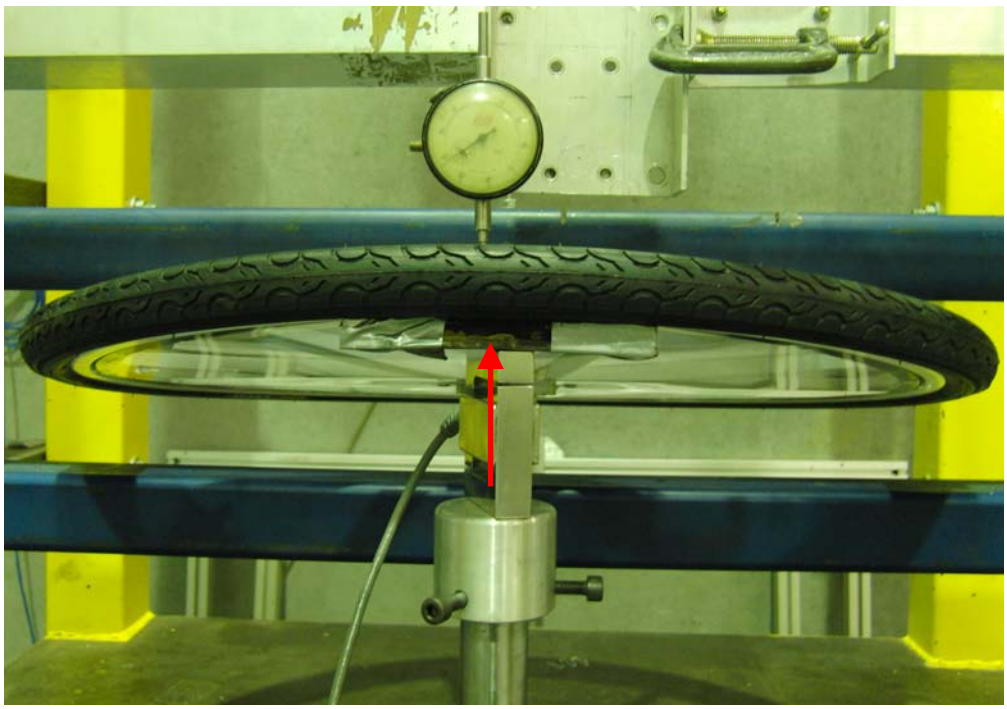

Figure 2: Deflection reached at maximum applied load in Test 1.

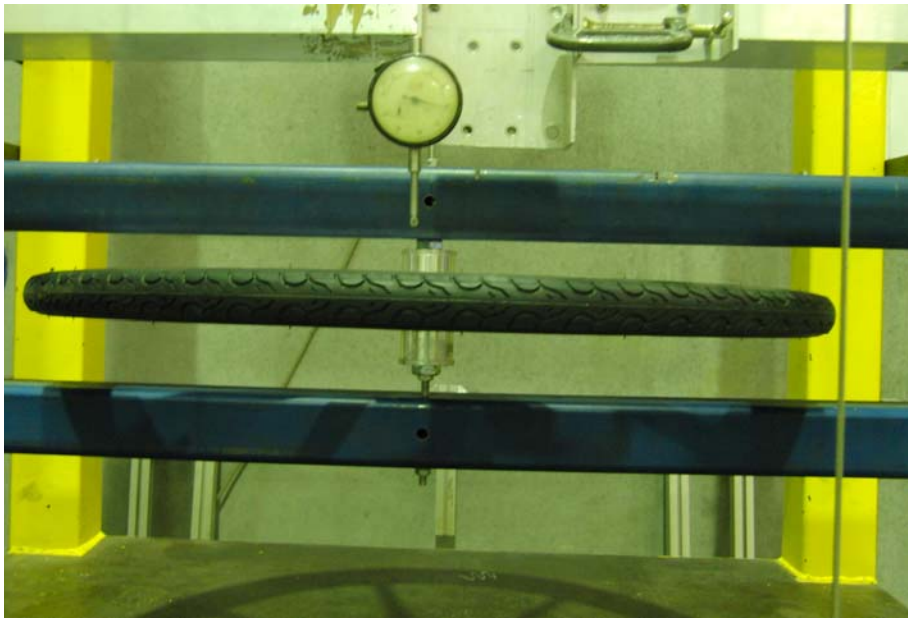

Figure 3: Residual deflection of wheel following removal from test rig

Results

Static Lateral Load Test Results

Wheel ID	Test No.	Lateral strength (N)	Maximum deflection (mm)
11-006	789	3081	73

Your wheel (ID #11-006) met the static lateral strength criteria of 1000N.

Test 2: Dynamic fatigue test

The fatigue test was to determine the fatigue life of the wheel, Figure 4. With the wheel hub secured, a 441 N load was applied to the wheel rim. The wheel was rotated continuously at a speed of 459 rpm.

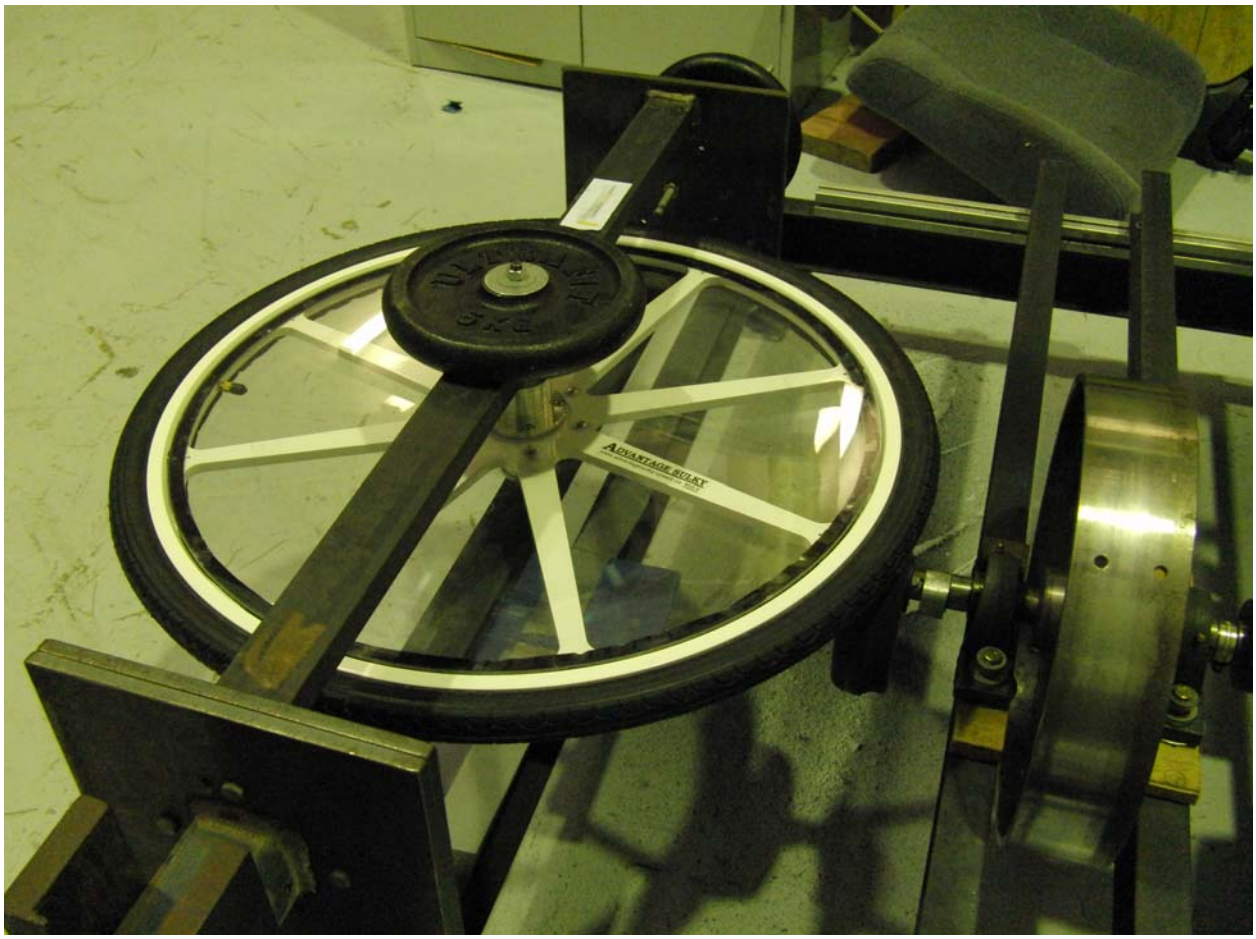

Figure 4 Fatigue test

Your wheel (ID #W11-005) performed 45716 cycles when there was no sign of failure. Testing was stopped at this point.

RESULTS

Fatigue Test Results

Wheel Id.	Test No.	Wheel Speed (rpm)	Dynamic Load (N)	Test Life (cycles)
11-005	788	459	441	45716

The wheel met the fatigue test criteria of 40,000 cycles under a lateral load of at least 420N.

Test 3: Other Requirements

Marking Requirements

Approved wheels must incorporate a tamper proof and externally visible display of date of manufacture, manufacturer, wheel model and a unique serial number (to be reported to Harness Racing Australia for approval).

The manufacturer (Advantage), the serial number (010) and the date of manufacture (2011) were marked on the hub of the wheels, see Figure 5. Both wheels had the same serial number.

The wheel model and the material were not marked on the wheels.

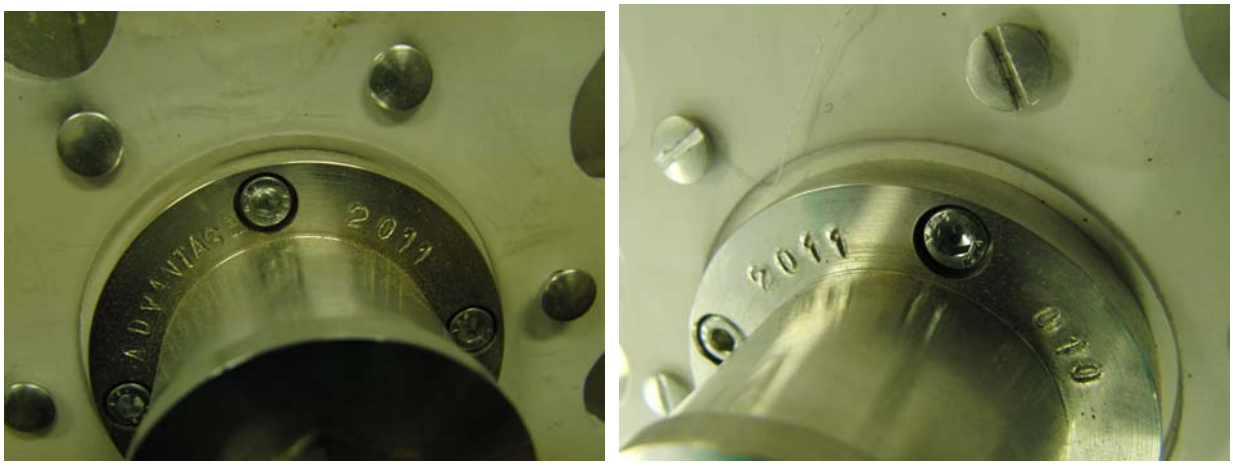

Figure 5 Engraved markings shown on wheels showing manufacturer (Advantage), date of manufacture (2011) and serial number (010)

Your wheels did not meet the marking requirements.

Please note: HRA prefers the date of manufacture to be formatted with the day, month and year of manufacture. Please address this with future wheels.

Size Requirements

Wheels and tyres must be approved by HRA. Approved wheels must have a diameter (including the tyre) in the range of 660mm to 715mm. Approved tyres must be no more than 50mm in width.

Wheels #11-005 & #11-006 were fitted with a tyre. The wheel including the tyre was 700 mm in diameter. The width of the tyre was 33 mm.

Your wheels met this requirement.