

**RENSAIR LIMITED** (originally commissioned by AirLabs Limited)  
**AIRBUBBL SLED TESTS**

**Contents**

1. Introduction .....	2
2. Pulse Choice Rationale.....	2
2.1 Euro NCAP Whiplash Medium .....	2
2.2 Euro NCAP Whiplash High.....	2
2.3 ST-0791 Seat integrity test (56kph) .....	2
3. Test Matrix .....	3
4. Fitment.....	3
5. Test results.....	4
SL118-01.....	4
SL118-02.....	4
SL118-03.....	4
SL118-04.....	4
6. Conclusion.....	4

## 1. Introduction

The purpose of these tests is to evaluate the performance of the after-market cabin air filter device called the "Airbubbl", during a simulated crash test scenario.

The test apparatus used is a reverse acceleration sled, called a "HyperG Sled".

Currently there is no legislation for dynamically testing this type of after-market device. It was decided to use current consumer test pulses and alter the test setup configuration to suit the customers' requirements.

The protocols that the pulses have been taken from are contained in the data pack coinciding with this document.

During the simulations the devices are subjected to a single acceleration over a very short period, this type of test would induce stress and forces to the "Airbubbl" to establish if the fixing mechanism does not become detached from a vehicle head restraint.

## 2. Pulse Choice Rationale

### 2.1 Euro NCAP Whiplash Medium

The IIWPG (International Insurance Whiplash Prevention Group) invented this pulse to evaluate the likelihood of injury in a rear impact, after studying real world impacts.

Euro NCAP and IIHS in the USA have adopted this test in their consumer rating schemes, it is deemed to induce an average change in velocity to an impacted vehicle which may be expected in a vehicle to rear of another vehicle collision.

The pulse is almost triangular in shape and comprises of a Maximum Delta V (change in velocity) of 4.57 m/s (16.45 km/h) with a Peak g of 11g and a duration of 94ms.

### 2.2 Euro NCAP Whiplash High

The SRA (Swedish Road Authority) produced this pulse from data taken from vehicles fitted with crash pulse recorders that were involved in road traffic incidents.

Euro NCAP have adopted this test in their consumer rating schemes, it is deemed to replicate incidents that may induce permanent seat back deflection, with the aim of encouraging seat manufacturers to design seats to withstand forces which could result in occupants being displaced from an intended restrained position.

The pulse is trapezoidal in shape and comprises of a Maximum Delta V (change in velocity) of 6.79 m/s (24.45 km/h) with a Peak g of 7.5g and a duration of 110ms.

### 2.3 ST-0791 Seat integrity test (56kph)

This pulse is used by seat manufacturers to ensure that the seat and accessories remain intact post-test and that there are no protrusions or loose objects that could cause injury to an occupant.

The pulse is a half sine wave in shape and comprises of a Maximum Delta V (change in velocity) of 15.556 m/s (56 km/h) with a Peak g of 23g and a duration of 130ms.

### 3. Test Matrix

The following sequence of tests were performed on 25<sup>th</sup> October 2018:

Test number	Test config	Pulse	Stills	Camera view 1	Camera view 2
SL118-01	Rear Impact	Euro NCAP Whiplash Medium (16kph)	At customer's request pre and post	Wide	Tight on fixing mechanism
SL118-02	Rear Impact	Euro NCAP Whiplash High (24kph)	At customer's request pre and post	Wide	Tight on fixing mechanism
SL118-03	Side Impact	Euro NCAP Whiplash High (24kph)	At customer's request pre and post	Wide	Tight on fixing mechanism
SL118-04	Front Impact	ST-0791 Seat integrity test (56kph)	At customer's request pre and post	Wide	Tight on fixing mechanism

### 4. Fitment

A vehicle seat was fixed to the "HyperG Sled" using mounts to replicate the orientation of the seat as it would have been in the vehicle it was intended for.

The "Airbubbl" was attached to the head restraint posts of a vehicle seat using a two part moulded rubber strap, which was attached to the body of the "Airbubbl" with a metal bracket and plastic retaining clip with a metal side release buckle joining the two rubber straps together.



## 5. Test results

### **SL118-01**

The test showed that the Fixing strap had elastic properties which were not exceeded to the point of failure and the metal buckle remained latched throughout the duration of the test.

### **SL118-02**

The test showed that the Fixing strap had elastic properties which were not exceeded to the point of failure and the metal buckle remained latched throughout the duration of the test.

### **SL118-03**

The test showed that the Fixing strap had elastic properties which were not exceeded to the point of failure and the metal buckle remained latched throughout the duration of the test.

### **SL118-04**

The test showed that the Fixing strap had elastic properties which were not exceeded to the point of failure and the metal buckle remained latched throughout the duration of the test.

## 6. Conclusion

The after-market cabin air filter device called the “Airbubbl”, remained attached to the tested seat’s head restraint in all test scenarios.

NB The tests conducted were limited to testing the attachment mechanism of the “Airbubbl”. The testing did not investigate any effect that the “Airbubbl” may have on other test and legislation requirements. It also did not consider how fitment of the “Airbubbl” might limit adjustments to any other mechanisms contained within seat designs.