

# Case Study

## Blazepoint

### Drop Test Analysis of an AVANTIX Mobile Chip and Pin Machine

#### Blazepoint Company Profile

Blazepoint is specialist design and engineering company based in the UK, having over 20 years of experience in the areas of industrial design, product development, testing and manufacture of bespoke printing solutions. One such example of a customised printing solution is the AVANTIX Mobile. It combines a PDA and a specially designed thermal printer for issuing tickets on the move or when a mains supply is unavailable. This product currently delivers tremendous benefits to the UK Rail Industry.



#### Background

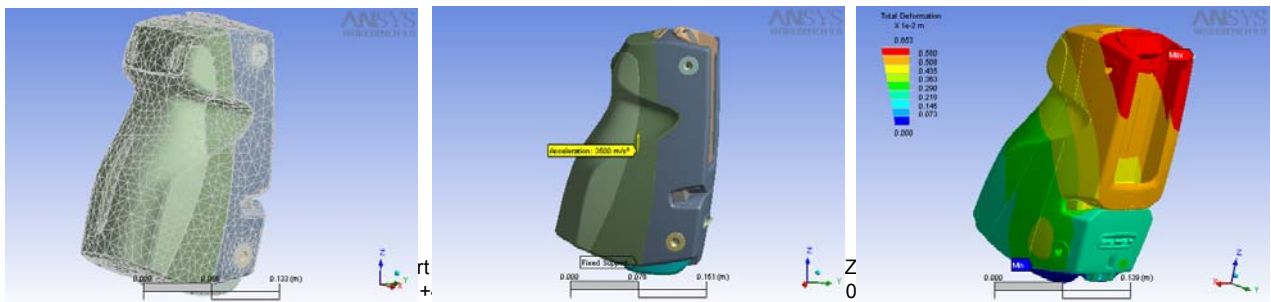


AVANTIX Mobile is a ticket issuing system used on Rail transport in Great Britain. It was originally designed by the SchlumbergerSema Group for the National Express Group to replace the old SPORTIS machines and is now developed by Atos Origin. The machine consists of the plastic casing that houses the printer, printer batteries, ticket stock and ticket cradle. Into this slides the PDA, which stores all the fares and timetable information. The thermally printed tickets emerge from the top of the printer. The AVANTIX Mobile provides quick and easy ticketing on the move for tickets from anywhere to anywhere, as well as providing train staff with fast, easy access to up-to-date fare and timetable information.

IDAC was approached to carry out a drop test analysis of the AVANTIX Mobile in order to evaluate the performance of the device's outer casing once dropped from a given height onto a concrete floor.

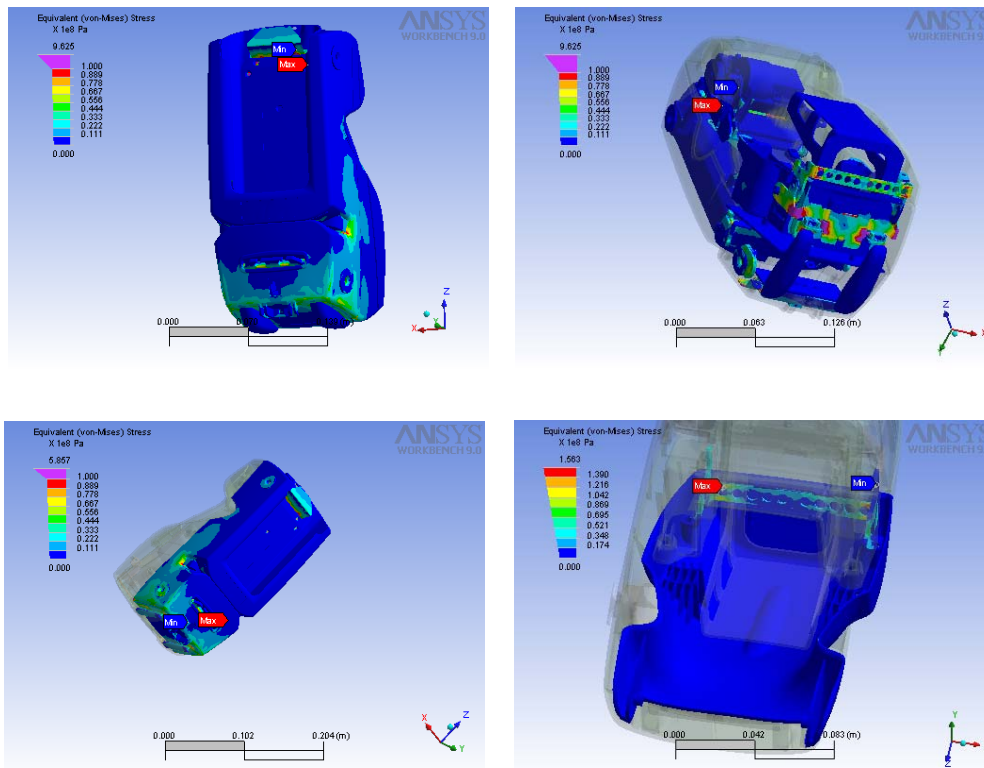
#### Analysis

The geometric model of the AVANTIX Mobile was provided in Solidworks format. The Solidworks CAD file was then imported into ANSYS DesignModeler to eliminate small non-structural features in order to decrease the model size and hence speed up computational time. The model was then imported into ANSYS Workbench, where it was meshed entirely with solid elements. The model consisted of an assembly, which included the printhead, cardreader, PCB all mounted onto a chassis and covered with a plastic casing.



The whole assembly was then imported into ANSYS LS-DYNA where the assembly was positioned in the 'just touching' condition to the floor, in an orientation specified by the client. An initial velocity corresponding to the specified drop height under a standard gravity load was applied.

In order to evaluate the stresses a quasi-static stress analysis was carried out in the ANSYS Workbench environment. This involved positioning the device on a plane and specifying the peak acceleration as evaluated in the LS-DYNA Analysis. From this analysis the vulnerable regions of the AVANTIX were ascertained to be areas where the equipment was bolted onto the casing. A selection of some regions on the AVANTIX Mobile that experience high stresses caused by the weight of the machine can be seen in the figures below.



## Design Benefit

The AVANTIX Mobile, which has been designed for issuing tickets whilst on the move, needs to be very robust and reliable. As such there is a need to verify that if the ticket collector drops the handheld device it would continue to work. A drop test Finite Element Analysis (FEA) highlights weaknesses in the design without having to manufacture prototypes for physical testing in a laboratory situation. Using **IDAC** and the ANSYS FEA software resulted in a significant cost and time-scale saving.

The results from this analysis have highlighted areas on the AVANTIX Mobile that experience high stresses. These are areas where equipment has been bolted onto the casing and as such would require some re-design to improve durability of the system if it were to be dropped when in use.

The durability of the AVANTIX Mobile is essential for its continuing success. It is possible that this product can be used for other applications in the future, to issue tickets whilst on the move or when a mains supply is unavailable such as car parking and event ticketing.