TRANSPORT OF DE-LIGHT:
THE DESIGN AND PROTOYPING OF A LIGHTWEIGHT CRASHWORTHY RAIL VEHICLE DRIVER’S CAB

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Summary. As part of the European Commission supported DE-LIGHT Transport project, a lightweight crashworthy rail vehicle driver’s cab structure was specified, designed and prototyped using composite sandwich material technology.

1 INTRODUCTION

The rail industry needs lightweight materials and structures for trains in order to meet the challenges it faces in terms of energy efficiency. Lightweighting also brings reductions in vehicle operating costs, and lighter vehicles cause less damage to track, thereby reducing requirements for infrastructure renewal.

Conventional rail vehicle cab structures are typically based on welded steel assemblies and are therefore relatively heavy. Furthermore, current cab designs tend to be complex, high part count assemblies with fragmented material usage. This is because they must meet a wide range of demands including proof loadings, crashworthiness, missile protection, aerodynamics and insulation. Assembly costs are high, and there is little in the way of functional integration.

2 A NEW APPROACH TO CAB DESIGN

As part of the European Commission supported DE-LIGHT Transport project, NewRail, the train builder Bombardier Transportation and the composite fabricator AP&M collaborated on the design, development and prototyping of an innovative modular rail vehicle cab based on advanced multi-material sandwich technology. Using Bombardier’s SPACIUM 3.06
commuter train as the basis of the study (Figure 1), the lightweight crashworthy cab concept that was developed contained a number of innovations compared to more traditional cab designs. These included a modular construction, an energy absorbing nose section, lightweight concepts for the main crash energy absorbing devices, and the use of an integrated composite sandwich for the main cab structure. The resulting concept provided structural, crash, aerodynamic and insulative functionality within a single integrated package. Upon completion of the design work, a full-scale prototype was produced to validate the manufacturing and assembly concept (Figure 2).

Figure 1 – Bombardier Transportation’s SPACIUM 3.06 commuter train.

Figure 2 – The full scale prototype of the lightweight crashworthy composite sandwich driver’s cab.

The conference presentation will describe the process by which the cab was developed, manufactured and evaluated. It will also highlight the lessons learned from the study and provide some recommendations for future implementation.

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