

Heavy metal

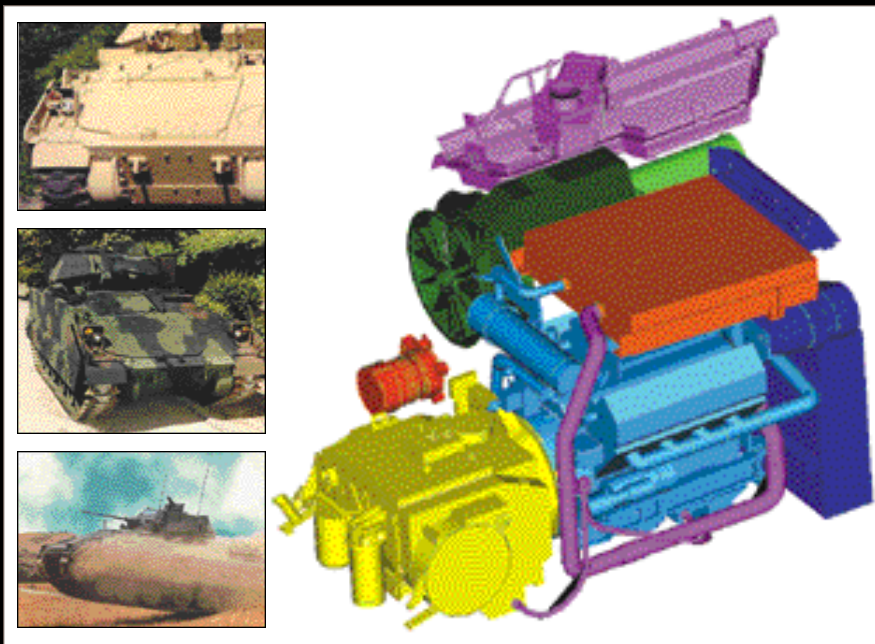
The fifty-year history of MIRA is littered with examples of non-automotive applications, but never has this been as pronounced as it is now. The newly formed MIRA Ltd. has specialist skills that are very well suited to applications in many fields. Some of this is far removed from the automotive industry (testing artificial trees in the aerodynamic wind tunnel for example) but the majority still lies within related fields. One of the Fluids Group's most prominent non-automotive clients is the UK's Ministry of Defence.

Military vehicles often have a look and function very similar to that of their civilian counterparts, but the philosophies behind their design (and obviously their potential applications) are very different. Reliability is a particularly good example of this divergence: most military vehicles have been designed to be depot-based with a full-time team of fully qualified service personnel close to hand. Whereas a passenger car might have a service interval of 20,000 miles, and a commercial vehicle might go 50,000 miles, for some military vehicles that interval might be as low as 500 miles. Other, more important, divergences stem from the business environment in which the vehicles are designed and manufactured. The car market is an oligopoly with limited brand-based loyalty. It is ultra-competitive and price-oriented and therefore is almost universally committed to continuous improvement and cost reduction.

Incentive

Because the market for military vehicles does not operate under quite the same strictures, it has not enjoyed anything like the advances made by the automotive industry in reducing its costs and improving its products – there simply isn't the incentive that a free-market creates. In an effort to close the gap, the MoD has begun a process of encouraging its suppliers to adopt the methods common to the automotive industry and the Fluids Group is one of the independent bodies that it has come to for advice.

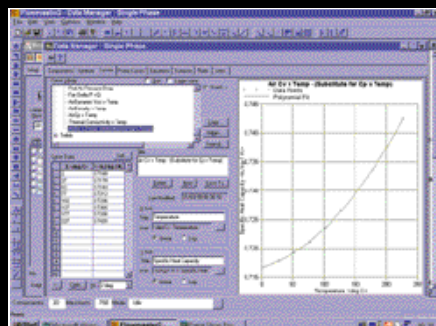
Dr Anthony Baxendale, head of aerody-



Techniques developed for passenger vehicles are applicable in many different theatres.

namics at MIRA explains: "MIRA is increasingly being seen as a technical resource for the MoD to call upon to give it impartial advice; to act as its expert advisors if you will. That relationship helps the MoD to develop or improve its supply chain."

"What the MOD saw in the automotive industry was continually increasing product reliability, increasing comfort and continually reducing unit costs. Through private enterprise within a very, very competitive global market, it contrasted the automotive market with the military supply chain. There are, of course, many differences, but there are also many crossovers – for example vehicle reliability; spare parts; modern battery technol-



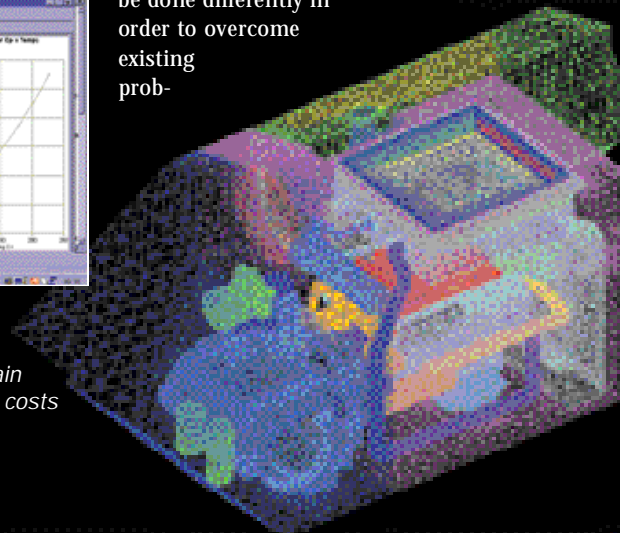
MIRA Fluids Group transfers automotive technology into the Ministry of Defence's supply chain to improve reliability and reduce costs

ogy; modern lubricants and, in the context of this project, modern design technology." MIRA's role is not merely one of offering advice; the collaboration also included a significant design input from day one. "With our first project we were physically contributing an injection of modern design analysis techniques – particularly cooling analysis techniques – into the MoD and into the MoD's principle suppliers of cooling systems for armoured personnel carriers (APCs) and other vehicles," confirms Baxendale.

"We weren't seeking to imply in any way that these companies were not experts in their own right, but rather the objective was to bring a fresh perspective from the automotive industry."

Cooling is a very complex challenge for a military vehicle and within the British Army this has been exacerbated by a very obvious change in role in the past decade – vehicles designed almost exclusively for use in the cool, temperate climate of North Western Europe are now serving in climate zones with twice the ambient range.

"The MOD did not want to carry existing cooling and reliability problems into the next generation of APC," explains Baxendale. "In collaboration with its suppliers it wished to assess what needed to be done differently in order to overcome existing prob-



lems, but also to meet this new scenario of global operation and the more severe cooling problems that entails.”

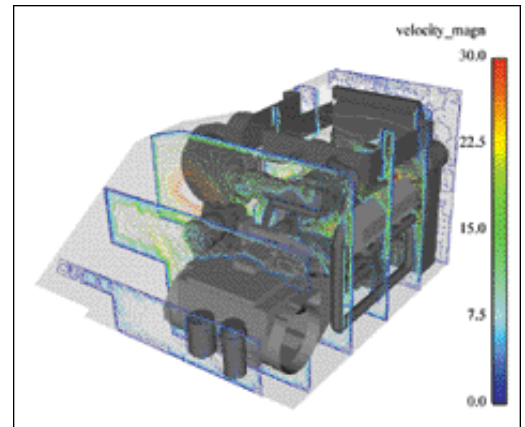
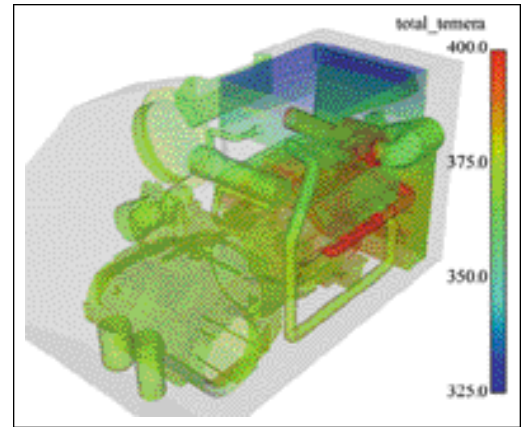
MIRA personnel had previously given a number of presentations to the MoD detailing the advantages of using simulation techniques very early in the development program and on the back of this expertise and experience the Fluids Group was commissioned to carry out an analysis of an existing APC.

“We delivered to the MoD a computer model of the existing vehicle, and a training course for some of their personnel in the use of these simulation techniques,” adds Baxendale. “We also produced a generic cooling module which allowed the MoD’s own experts to do ‘what-if’ scenarios quickly – ‘what if we block the radiator by 50 per cent because of sand ingress?’ ‘What if we increase the size of the fans by 50 percent?’ ‘What effect does that have on cooling temperatures?’ They wanted a simple tool that could provide answers to these questions, and we provided it.”

Mindful of the need for a genuine transfer of technology, MIRA also organised a major

presentation at the MoD’s Abbey Wood headquarters near Bristol for over a hundred representatives from the supply industry.

Although the project was carried out with the same tools and expertise that MIRA has applied to automotive projects for many years, the task was subtly different when the customer’s products were all painted green. “The priorities are not quite the same,” admits Baxendale. “As is the case with a normal automotive industry application, the designers of APCs need to get as much air-flow through the radiator as possible – however the other objective with a military vehicle is to protect the occupants from attack. Those two objectives are opposed – the more air you get in, the less protection you’ve got. There is a complex trade off there. Again, we sat down with the MoD to look at the results of our study and took it through how we can run ‘what if’ scenarios quickly using CFD. We weren’t commissioned to design anything, only to do an analysis of an existing design, looking at its strengths and weaknesses – a validity check, if you like, or a confidence builder for the MoD and its supply chain.”



Taking well-established automotive simulation expertise into the military design arena