Swift Group - Leading The Way In Aerodynamics

The Swift Group, the UK's leading caravan, Motorhome and Holiday Home manufacturer, have been aware for a number of years that customers are becoming increasingly concerned regarding rising fuel costs making the cost of using a leisure product more costly.

In the last 2 years, the cost of fuel has rocketed from under £1.00 / litre to over £1.35 / litre and to counter this, The Swift Group have undertaken aggressive weight savings on all our products to improve the fuel efficiency of the tow car while towing a Swift Group product.

Along with other similar industries, The Swift Group recognise that the weight of a towed product is only one contributor to the fuel consumption of a tow car. The drag of the tow car and towed vehicle can have a significant affect on the fuel consumption.

The Swift Group continues to lead the leisure industry. In the 1970's, with a number of partners, The Swift Group utilised early wind tunnel technology to lead the research into aerodynamic airflow around a caravan, and the conclusions helped to shape the future of caravan designs.

However, the belief has always been that the air flow around the tow car has such a massive affect on the towed vehicle that a study of the aerodynamics of a caravan was a pointless exercise, until we reviewed these principles.

Currently a number of manufacturers claim that their products are aerodynamic but this has always been based on subjective (non-scientific) data, for example rudimental towing trials.

In June 2011 The Swift Group took the unique step of conducting a Computational Fluid Dynamic (CFD) scientific study on its most popular caravan ranges to better understand the aerodynamic performance of our products. The objective of this study was to prove that our products were more aerodynamic than leading competitors and also show the industry that, as a group, we could improve the aerodynamic performance of our products, which would help to reduce fuel consumption.

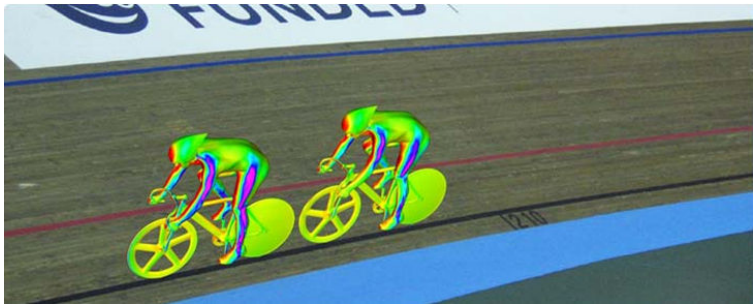
Using the services of a leading consultant Dr. Rob Lewis and his company TotalSim a number of studies on our and competitor products were undertaken. We are delighted that Rob and his team work exclusively for The Swift Group on these types of studies

Rob Lewis graduated with a degree in Mechanical Engineering from Leeds University in 1991 and won a PhD scholarship to stay at Leeds and study CFD codes for combustion. After being awarded his PhD in 1994, Rob joined FLUENT Europe where he managed a team of support and consulting engineers.

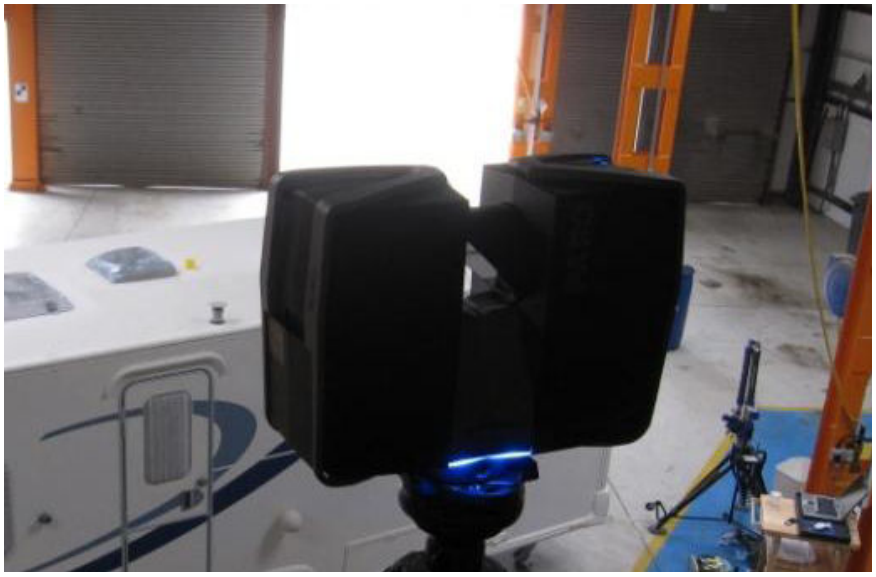
In late 1997, Rob left FLUENT to start AdvantageCFD (A-CFD) with Adrian Reynard at Reynard Motorsports. A-CFD supported all of Reynard Motorsports designs from Champ Car to the BAR F1 cars. Rob grew the A-CFD organization to 25 people by late 2006 when it was an essential part of Honda F1 Aerodynamics Dept. AdvantageCFD succeeded in setting the standard in motorsport CFD from inception to its closure in 2007, including Rob's pioneering use of OpenFOAM.

The switch in focus away from any outside consulting by the Honda F1 Racing Team gave Rob and some of the team at A-CFD the chance to continue working with their clients by creating a new company, TotalSim Ltd, which they formed as a largely employee owned company in early 2007. Currently, Rob is Managing Director of TotalSim Ltd. which employs 17 staff in Brackley, UK and works on a wide range of projects from motorsport to green energy.

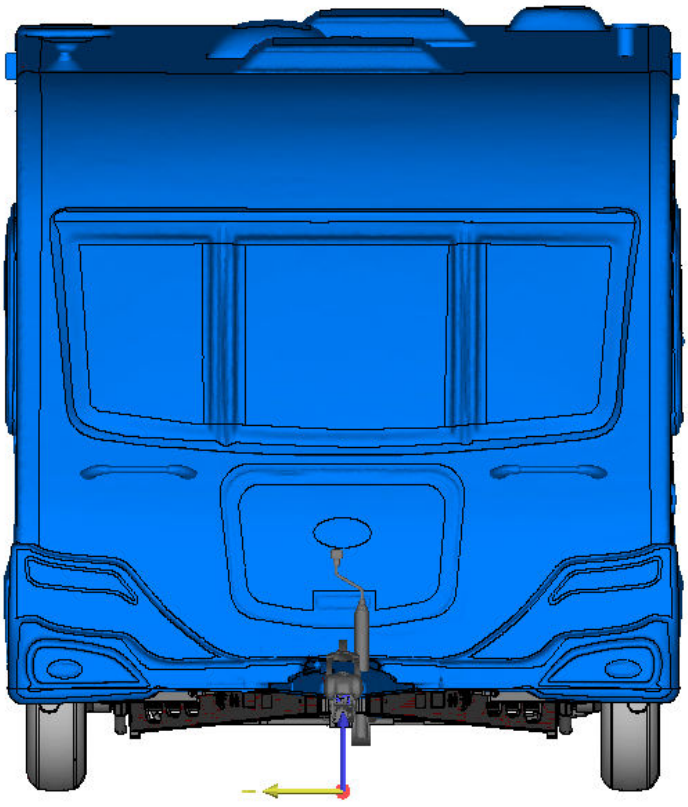
Recent TotalSim projects have included road car aerodynamic optimisation, aerodynamics support for an F1 team, development of a new aero concept for a Le Mans LMP1 car, work for UKSport on track cycling, and other Olympic sports.



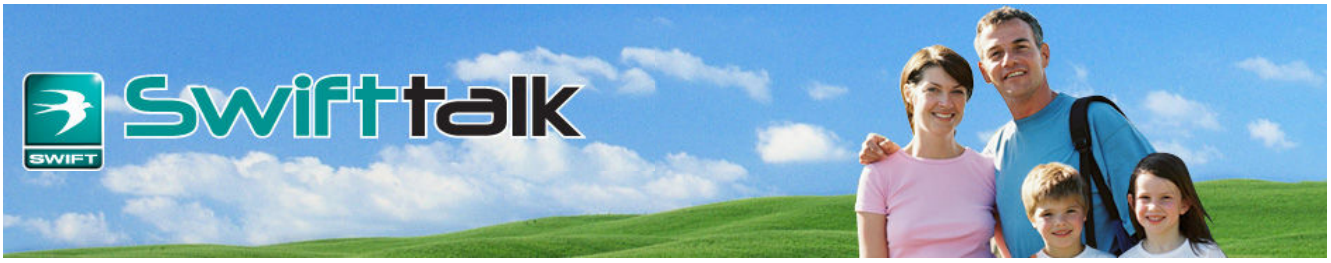
To be sure that accurate data was analysed, caravans were digitally scanned using the latest 3D laser scanning techniques at a specialist facility. This laser scanner included the overall caravan scan, converted into a non-parametric IGES data file with near perfect accuracy, along with a number of smaller components being digitally created using a Faro arm.



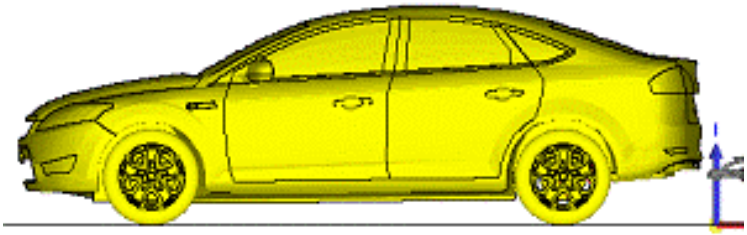
The Swift Group lead the way in this type of large scale scanning, with a number of technical challenges, including the reflective nature of the body shell, being over come with unique methods.

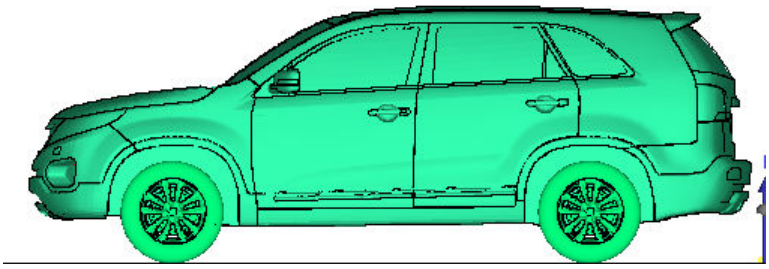


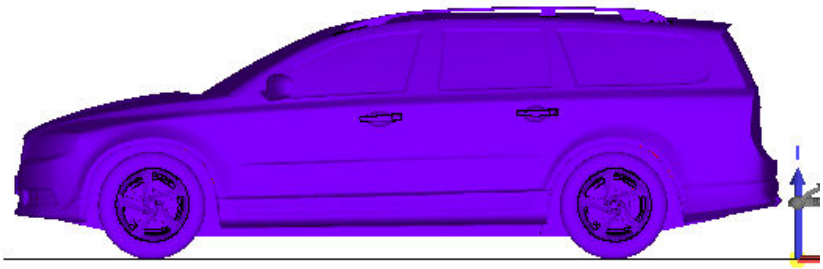
The Swift Group then purchased the hi-resolution 3D data files of a series of three tow cars to represent common customer cars (saloon, estate and 4x4).



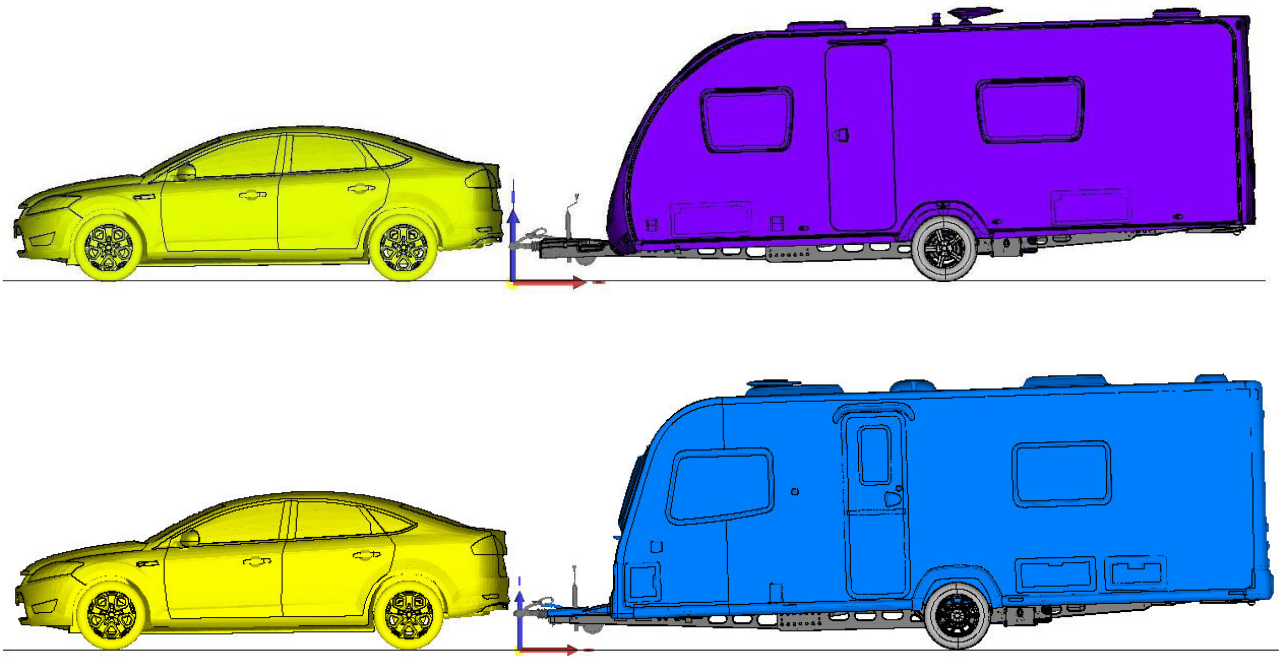
The choice of these cars was taken after analysing actual customer data from the Swift Group's Swift Talk social network site, another unique first for the industry allowing direct communication between the Swift Group and our customers. No other OEM is able to offer this level of near 24/7 communication.



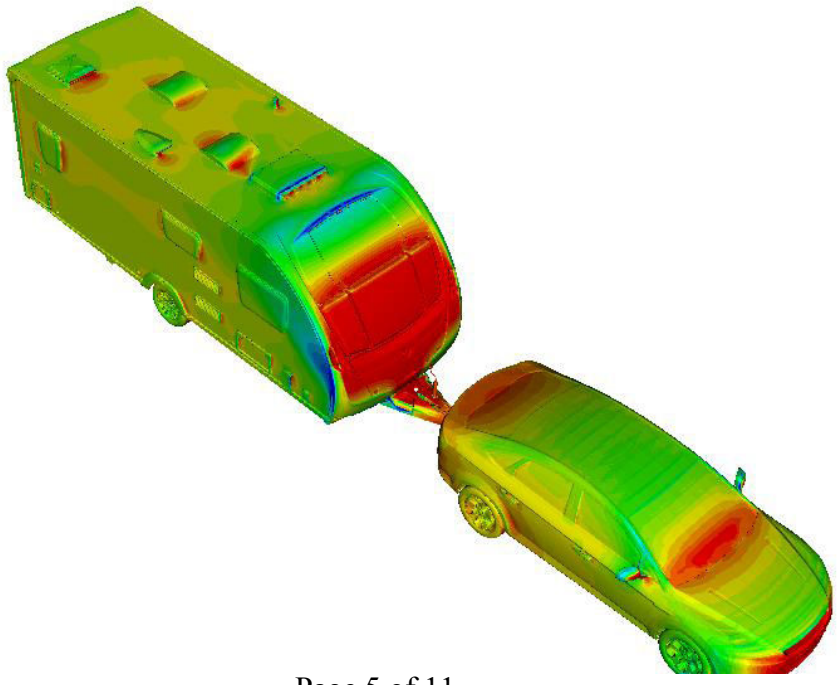


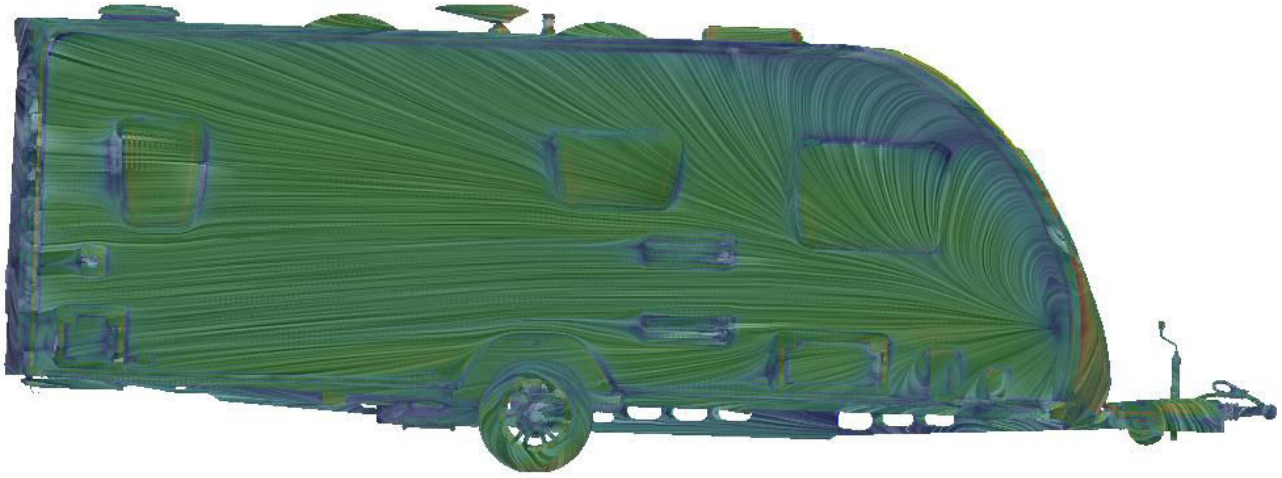


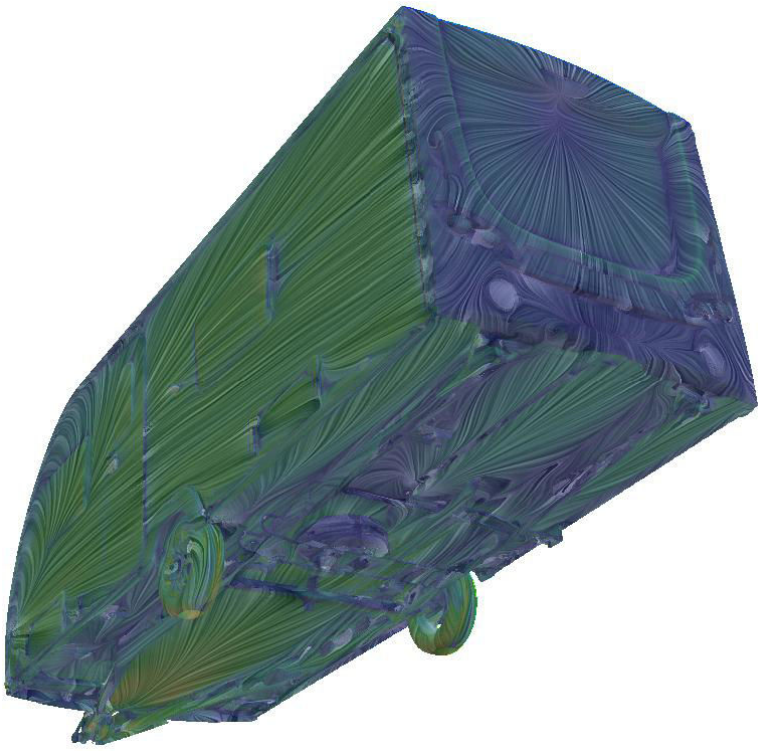
Using a set of parameters each caravan and tow car combination were placed in a “towing condition”, and with the use of a global co-ordinate system which then made each analysis results comparable to another.



A number of field and parameters were analysed to understand the airflow around the caravan. This included a number of techniques to eliminate the differences in sizes between the caravans (to obtain data that was directly comparable) and the understanding of near wall velocity around the caravan:



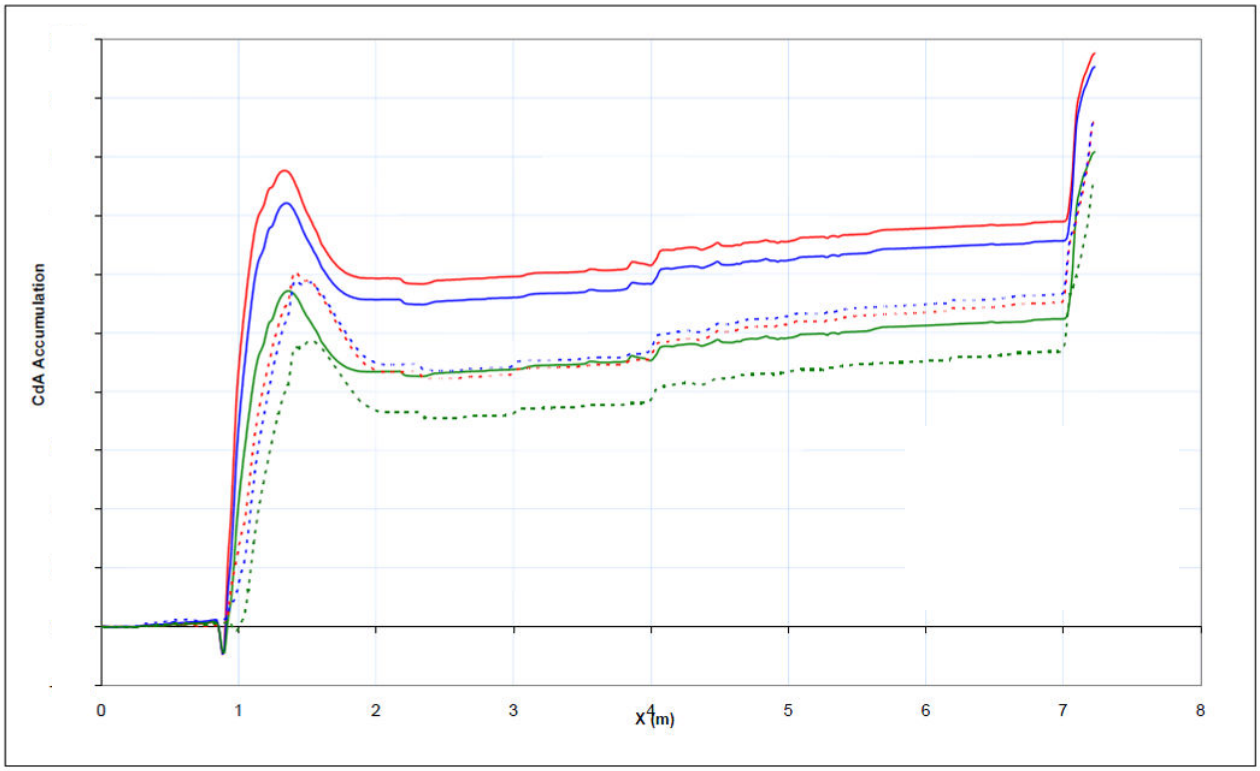




Being the first to perform a meshed fluid dynamic caravan study with a simulated moving ground and rotating wheels, even the experts were unsure what to expect. While a series of pre-meetings had concluded we could “guess” the affects of the towcar and the difference in the shape of the caravan, the actual result even surprised Dr. Rob Lewis.

To confirm these results the 1.5Gb of raw data was re-analysed, tabulised and shown in graphical format to understand the results.

The first step in this understanding was to convert this data into non-dimensionalised drag (CdA), which eliminates the size differences between the various models. A drag accumulation plot was then created to understand the causes of the drag.



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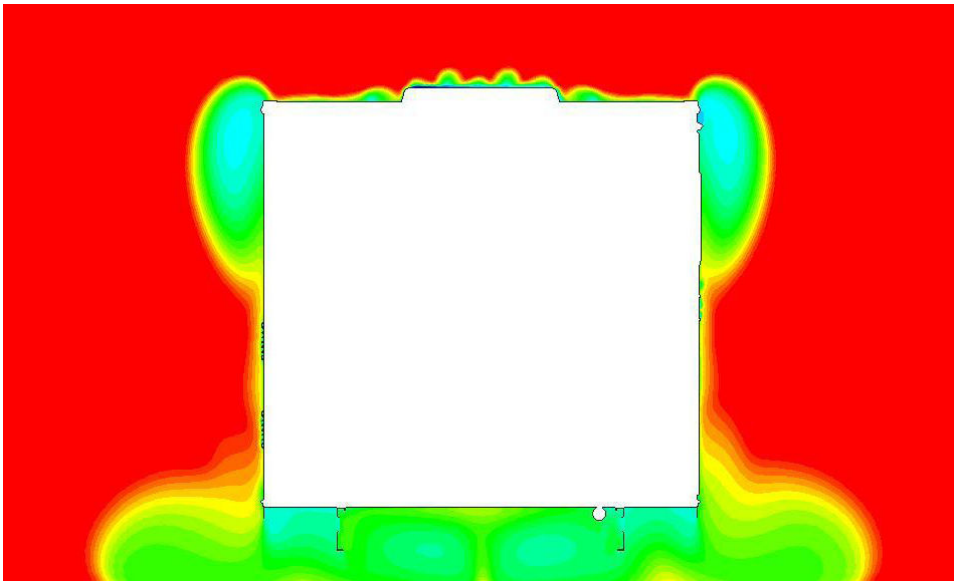
By comparing the areas of accumulation, we could understand the difference between the models and more importantly (reviewing the CAD data) understand if these were accurate. In all cases, the areas of drag could be explained using rational theories.

We then studied the flow around each of the models to understand areas of thrust and drag on all the models used. Again, the results were surprising with the smaller features not having as great an impact as first thought.

By comparing the flow in CpT (Total accumulation of flow energy) form, a direct overlay between the models could be performed.



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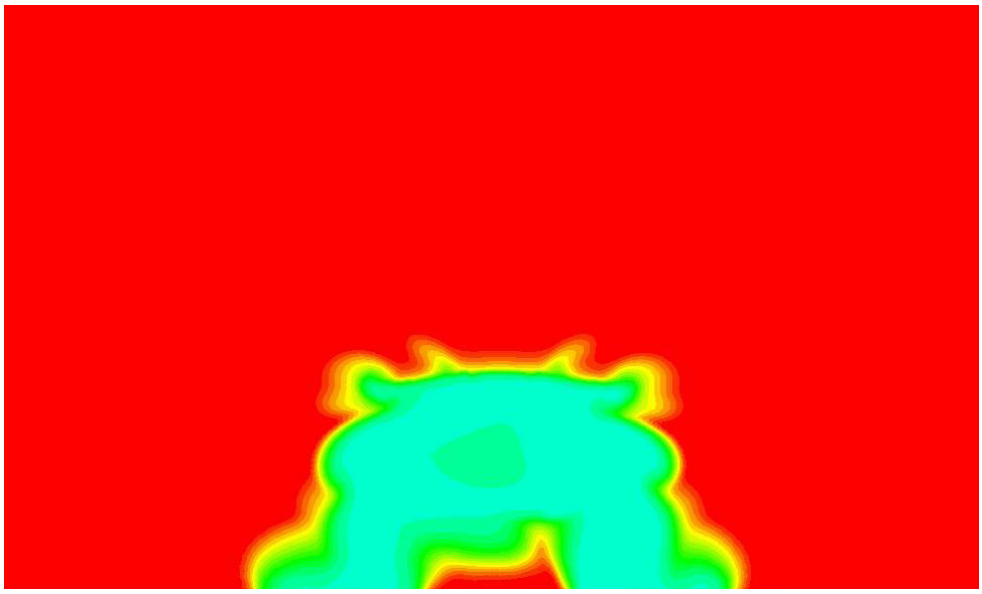
The tow car CpT were also viewed to understand the turbulent flows around the caravan.



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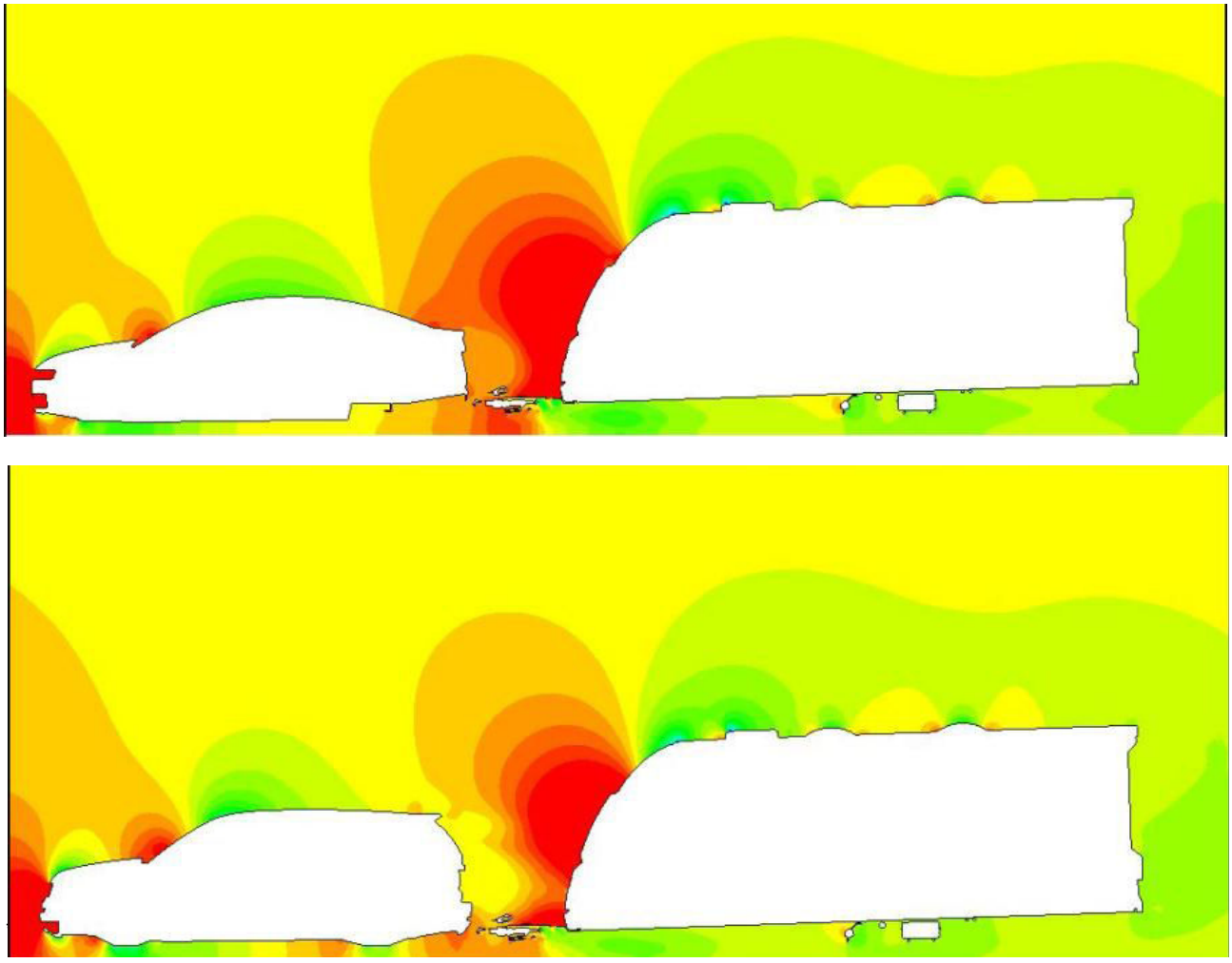
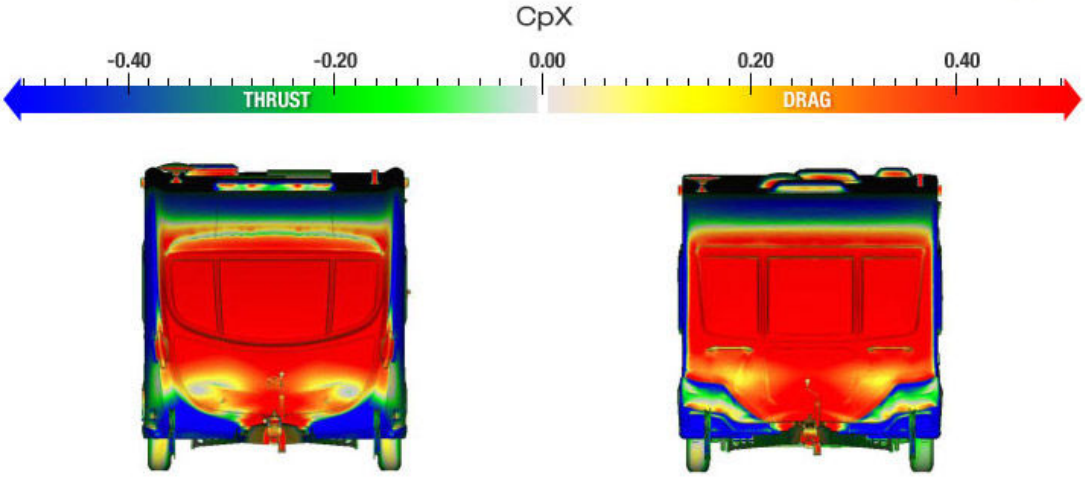
Finally, a flow comparison was undertaken with the tow-car in situ, and the overall affects studied:



The ground breaking results have lead to **five** patent applications being filed by The Swift Group based around new designs and proposals for reducing the drag of a towed vehicle further.

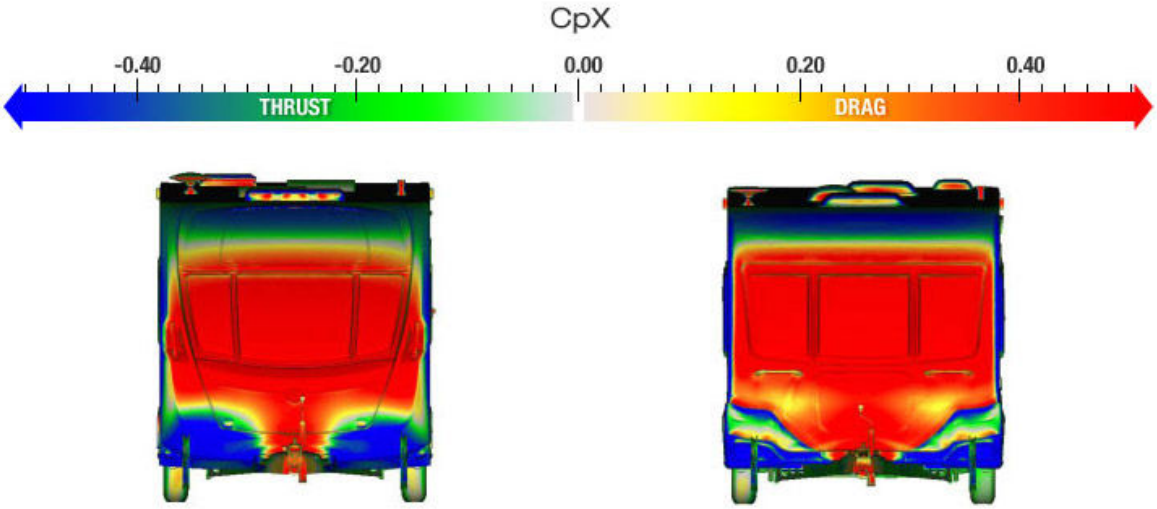
These ideas are currently being incorporated into our products and the next generation of Swift Group caravans to ensure that our customers can achieve the best fuel economy across the industry.

However, based on the situation today, we are able to draw the following conclusions which show buying a Swift Group product means a significant fuel saving over the nearest competitor:



2012 Swift Challenger/Conqueror Vs. Leading Competitor Caravan

- The 2012 Challenger/Conqueror has **10%** lower non-dimensional drag across a range of typical tow vehicles than a leading competitor caravan.
- When considering a typical family estate tow car, the 2012 Challenger/Conqueror has 13% lower non-dimensional drag than a leading competitor caravan.
    - This equates to a reduction of the drag force of **19.2Kg**



2012 Swift Challenger Sport Vs. Leading Competitor Caravan

- The 2012 Challenger Sport has **3%** lower non-dimensional drag across a range of typical tow vehicles than a leading competitor caravan.
- When considering a typical family estate tow car, the 2012 Challenger Sport has 7% lower non-dimensional drag than a leading competitor caravan.
- This equates to a reduction of the drag force of **9.2Kg**.

The study, which is another step forward for The Swift Group offers our customers improvements that makes their ownership of a Swift Group caravan even more cost effective to own.

An EC Type Approved durable aerodynamic caravan combined with Hankook tyres, with an additional 10% safety margin, ATC trailer control as standard across a number of models and now a 10 year Bodyshell Guarantee,

The Swift Group are changing the way customers think about caravans.