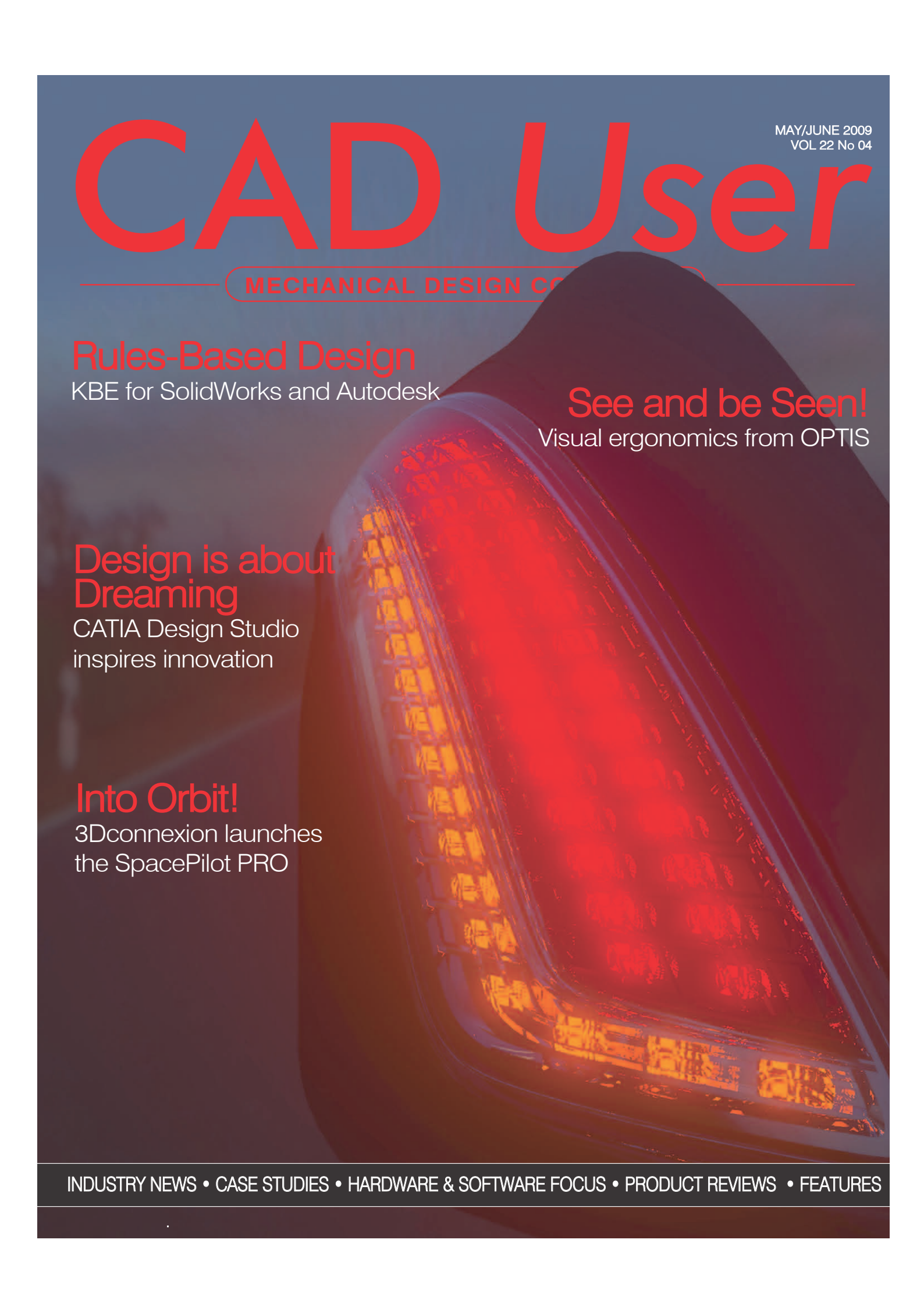


# CAD *User*



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MECHANICAL DESIGN CO

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KBE for SolidWorks and Autodesk

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Visual ergonomics from OPTIS

## Design is about Dreaming

CATIA Design Studio  
inspires innovation

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# See and be seen!

OPTIS software is based on a unique Human Eye Model, and offers advanced lighting design capabilities for aerospace and automotive manufacturers, writes David Chadwick

I am always fascinated by the simulation of light in design, and never more so when looking at the case studies that OPTIS send me. Here we have some interesting applications for what they call "Visual Ergonomics" using their SPEOS package - one in the aerospace industry, and the other looking at the automotive industry - that illustrate the growing trend towards the use of LED light sources.

Why are these applications so fascinating? Probably because they (literally) highlight areas of design that we don't often think about - although they are critical elements in each area. Whilst we expect the cabin layout of an aircraft to be extensively modeled and analysed, we rarely hear about what the pilot can see inside and outside the aircraft when he is flying directly into the sun! And when I look at the latest head and taillight designs, I am struck by the complex configurations of the interior surfaces. These are modeled using software like SPEOS to ensure maximum performance.

## COCKPIT SAFETY

OPTIS' SPEOS optical simulation software allows aerospace engineers to maximise pilot cockpit safety, especially in military applications where reduced internal and external lighting conditions are often required. The software, which precisely simulates the behaviour of the human eye, is integrated into leading CAD applications, in this case, CATIA V5. It allows aircraft designers to refine the interior features of flight decks optimising interior lighting, control displays, reflective surfaces and the exterior view as perceived by the pilot.

The software considers the variables that affect a pilot's perception, such as the materials used in the interior construction, reflective screen displays and surfaces,

windscreen filters, heads up display (HUD) performance, landing lights and even the position of the sun and moon.

Pointing out the benefits to both pilots and design engineers, Pete Moorhouse, VP Sales & Marketing at OPTIS, commented, "For the aerospace sector, improving safety and reducing pilot fatigue are fundamental issues. The OPTIS approach also saves aerospace sector manufacturers time and money, by cutting the need for expensive test flight programs.

"We can simulate practically every possible combination of interior design without leaving the ground - aircraft location and external lighting conditions such as an airfield at night or an aircraft carrier under combat conditions. We analyse what the pilot actually sees, rather than other methods which only use simple ray tracing methods with no reference to the

human eye and its complexity."

One leading aircraft manufacturer is using the software to simulate what a pilot sees during a night landing, including when a plane lands on an aircraft carrier with minimal landing and navigational lights.

According to Bombardier Aerospace, OPTIS is the only solution which enables them to accurately predict glare, reflections, and other real-life factors which could distract or tire the pilot, to the point of compromising comfort and ultimately safety. "By eliminating negative points early in the virtual design stage we expect to reduce our design time by 50% and avoid costly prototypes. Thanks to SPEOS' integration in CATIA V5 we already knew the interface, so it took just 2 weeks for us to learn SPEOS," said Richard Heppell, Manager Core Systemes Engineering, Bombardier Aerospace.

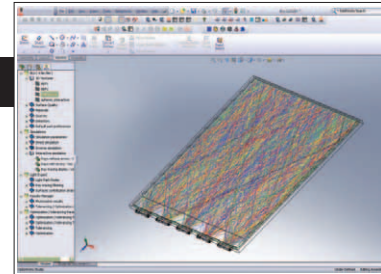
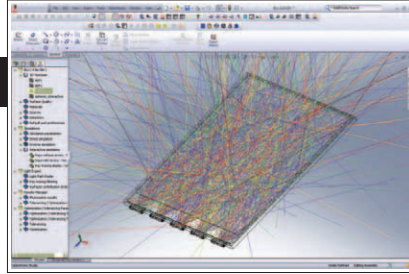
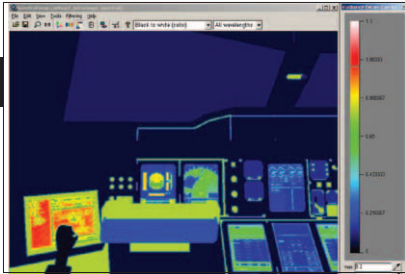
## NEXT STAGE DEVELOPMENTS

The next stage of OPTIS's software development is to offer simulation results inside immersive virtual reality scenarios, providing an even more accurate representation of the effect on a pilot's view during an aircraft's landing or take-off phase and the accompanying changes in lighting conditions.

Moorhouse said, "This is where we see the next phase of physics-based simulation. In combination with appropriate input devices we can provide a flight simulator-like experience, including the optical changes that occur during any change in position or lighting conditions. Manufacturers are also interested in using the software to simulate pilot visibility during mid-air refuelling to overcome glare problems caused by the sun."

## 3D TEXTURES

In another development, OPTIS has announced that its 3D Textures package has been integrated into OptisWorks, the SolidWorks add-in version of OPTIS's SPEOS software, enabling engineering



Interactive simulation without and with 3D Textures

designers to model complex integrated mechanical and optical engineering tasks seamlessly within SolidWorks.

Modelling optical performance of devices in conventional CAD packages has proved either impossible or extremely time-consuming. 3D Textures for OptisWorks now enables both improved design functionality and time-saving in challenging applications such as modelling backlit displays and the latest designs of automotive lights.

Günther Hasna, Consulting & Services Manager at OPTIS, commented, "Among OEMs and suppliers we see increasing demand for integrated optical and mechanical design packages and for generic platforms. Using a standalone CAD package, combined optical-mechanical design simulation is very time-consuming. Without our integrated package it would be almost impossible to achieve simultaneous optical and design simulation, with increased complexity of designs and surfaces."

Using 3D Textures For OptisWorks, a designer can easily create tens of millions of modelled points on optical surfaces, with a reduced memory requirement for simulations (150Mb needed for 1 million patterns), a rapid loading time and fast simulation time (16min for 4 million patterns).

Besides its performance enhancements and easy integration into the SolidWorks software, 3D Textures For OptisWorks offers several improved optical design capabilities when compared with OPTIS's established SPEOS package, including modelling patterns onto any possible CAD shape and surface (SPEOS and others offer relatively basic functionality) and

modelling based on diverse materials of construction (compared with other packages' single material). OptisWorks also offers fully optimised multithreaded and 64-bit operation, which other packages cannot match.

Applications that benefit from 3D textures include the design of complex compound surfaces and textures such automotive tail lamps, LED luminaire design or in backlights for PDAs and mobile phones.

#### TAIL LAMP DESIGN

Inside the latest designs of vehicle tail lamp units there are various complex combinations of components, elements and surfaces (often made of different polymers) that guide the light around the unit and out for other road users to see. From the typical multiple-LED source the light passes through channels and into reflectors embedded in the plastic unit.

The complexity of light source arrangement and the materials, angles and surfaces of the lamp units are an ideal environment to show not only the versatility and speed of the latest OPTIS software package, but also the possibility of easily reducing the number of light sources - and therefore cost and power draw - without compromising the brightness and clarity of the light.

Günther Hasna commented, "Tail lamp design is an iterative process, in which the designers are constantly wanting to refine and modify the internal structures. With 3D Textures For OptisWorks, we can now simulate the progress and flow of the light from the tail lamp as the internal design is modified; we can then optimise the light distribution so that it performs in the optimal way. By this means we can

effectively simulate the "lit" appearance of the tail light/reversing/brake lights."

#### DISPLAY DESIGN

The backlight unit of any display, such as for a mobile phone handset or PDA, is typically textured. Millions of microscopic polymer "pyramids" are placed on the backplane to redirect or diffuse light that usually comes from an LED source or similar (see diagrams 1 & 2).

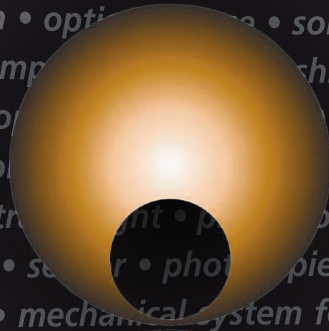
3D Textures For OptisWorks allows display designers to simulate the exact result of changing designs and distributions of the all-important pyramids. As there is a need for more diffractive elements on the further edge from the light source to compensate for light drop-off away from the source, there is no uniform density of pyramids in a given backlit display. Design engineers using 3D Textures For OptisWorks can easily optimise the delivery of light from a display, improving energy efficiency and even reducing the number of light sources required to maintain brightness.

Design improvements made possible with 3D Textures/OptisWorks have demonstrated a reduction in the number of LEDs needed in one lighting design from 12 to 3, and in one particular mobile phone display the number was reduced from six to just one - with a better distribution of light! Images 1 and 2 above contrast the "with 3D Textures" and "without 3D Textures" of the optimisation of pyramid placement in the design of a backlit display.

*OPTIS will be presenting its aerospace focussed solutions at the Paris Air Show in Le Bourget, France, between 15-21 June 2009 - more information at [www.paris-air-show.com](http://www.paris-air-show.com) [www.optis-world.com](http://www.optis-world.com)*

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