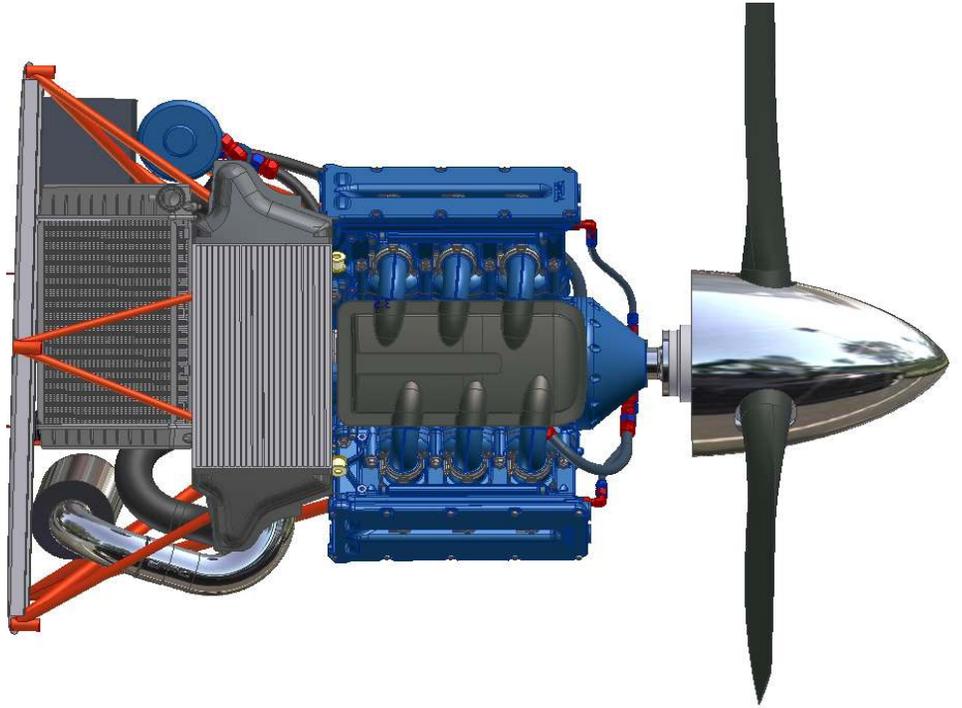


Without Inventor, this project wouldn't have been possible.

—Raymond Bakker  
Designer  
ADEPT Airmotive

# Flying High

Using the Autodesk solution for Digital Prototyping, ADEPT develops an innovative, highly competitive aviation engine.



Since ADEPT Airmotive (ADEPT) opened its doors four years ago, the company's mission has been crystal clear: develop a general aviation aircraft engine that blows away the competition. To achieve this goal, Adept wanted to harness the most advanced technology and design processes in the industry but in South Africa, where Adept operates, the aerospace and engineering industry is small and receives limited funding. As a result, ADEPT operates on a lean budget—and must keep costs low. The Autodesk solution for Digital Prototyping has eliminated barriers and reduced costs throughout the product development process for ADEPT. From conceptual design to manufacturing, ADEPT is boosting efficiencies, minimizing expensive downstream changes, and innovating faster by leveraging a single digital model. Thanks to the Autodesk® Inventor® software that is the foundation of Digital Prototyping, ADEPT has been able to:

- Develop a prototype engine that weighs 60kg less than comparable engines
- Complete processes in minutes that once took hours
- Reduce costs by minimizing the need for tooling changes
- Produce fewer physical prototypes before manufacturing components

Typically, aviation companies are large and slow to embrace change. ADEPT isn't a typical aviation company. "We're very small, focused, and enthusiastic," explains Richard Schulz, managing director at ADEPT. Even though it operated on a modest budget for many years, the company's vision has always been ambitious. "The aircraft industry stagnated for almost forty years, even as automotive engine technology advanced rapidly," continues Schulz. "Our goal is to leap the chasm between automotive engine technology and general aviation engine technology to design the most technically advanced engine available outside a military program."

With its sights set on developing an engine competitive in weight, fuel efficiency, and design, ADEPT developed an engine architecture unique to the aviation industry—a 120 degree, V6 configuration that vastly outpaces the industry's standard air-cooled flat 4 or 6 engines. But the approach does have its challenges. "We can't purchase off-the-shelf components," says Schulz. "And that means that we have to design every component and rely on digital models to confirm design decisions, fit, and function. We also have to design our own tooling," he adds.

At first, ADEPT used a different CAD program to develop its digital models and 2D drawings. While cost-effective, the solution didn't always give ADEPT

# Thanks to Autodesk, ADEPT is reaching its goals of developing a truly innovative general aviation engine.

what it needed. “We were frustrated because when we’d progress far down a design path and then had to make changes deep in the model, it involved a lot of rework,” says Raymond Bakker, designer at ADEPT. “Even finding the position in the model to make the change was very awkward. We couldn’t afford an unnecessarily convoluted process.”

## The Solution

Autodesk Inventor software—the foundation of the Autodesk solution for Digital Prototyping—has been a revelation for ADEPT. “Digital Prototyping is absolutely critical because it allows us to bring a single digital model through every phase of design and development through to manufacturing and marketing,” says Schulz. “At an early stage, we can bring customers into the decision-making process using a digital model that truly sells a flying experience.”

With Autodesk Inventor, ADEPT is able to transform its ideas into an innovative, highly efficient design process even though the engine is very complex. “Once we create a sketch in Inventor and define the geometry of a 3D model, we get team input,” explains Bakker. “Then we tweak the design on the fly and do interference checks and refinement. It’s very fast and intuitive—a tool for ‘everyman.’”

In fact, making changes that once resulted in tons of rework is now effortless. “With Inventor, we’re able to do parametric models so that we can change a wall thickness on motor packaging, for example, without having to remodel everything,” says Bakker. “What a huge advantage.”

Digital Prototyping is also reducing manufacturing issues. ADEPT has such confidence in the digital prototypes it creates using Autodesk Inventor that it often bypasses physical prototyping. “If we don’t need a physical prototype for something downstream, we’ll manufacture components directly from the digital prototype,” says Bakker. “If

the part is manufactured according to the tolerance specs and interference checks, we know the part will fit. We’ve had very few fit issues thanks to Digital Prototyping.”

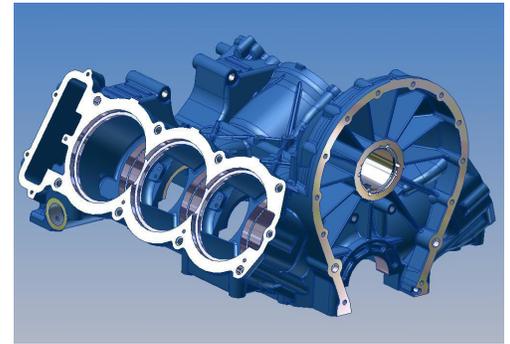
## Seamless Tooling Design

With Digital Prototyping, ADEPT is meeting one of its primary requirements: to design tooling simultaneously with components. Digital Prototyping breaks down barriers, from conceptual design all the way through to the development of tooling and manufacturing, enabling ADEPT to innovate faster and more cost-effectively. “We’re able to incorporate tooling considerations into the component upfront as we design it,” explains Bakker. “We don’t have to do a lot of editing of the component downstream to make it toolable. And because we don’t have to subcontract tool design, we’re reducing costs significantly.”

Digital Prototyping also lets the company’s designers and engineers collaborate early in the development process. As a result, ADEPT’s designers not only consider tooling upfront, they incorporate engineering constraints and requirements from the earliest stages of design. “If we’re designing a piece of metal that needs to perform certain functions, there are certain laws of physics we must follow. But we don’t want our designs to be merely functional, they need to be beautiful too,” says Schulz. “Digital Prototyping helps us make engineering changes, see the impacts visually, adjust them aesthetically, and then develop the tooling. It’s an amazingly efficient process.”

## The Result

Thanks to Autodesk Inventor and Digital Prototyping, ADEPT is reaching its goals of developing a truly innovative general aviation engine. Its prototype engine weighs 60kg less than a traditional piston engine of a similar output. “Lower weight is a huge advantage, especially for aerobatic and air racing competition,” says Bakker.



Processes that once took hours, such as changing geometry deep within a part, now are completed almost instantaneously in Inventor. And in less than two years, a core team of three people has produced an engine ready for tooling—an incredible accomplishment. “We’re very, very happy with Inventor software,” says Schulz.

“Inventor is such a delight,” adds Geoff Cronje, design director at ADEPT. “The user interface is superb; so easy to use out-of-the-box.”

Not only are ADEPT’s design processes more efficient, they are also having a big impact on project costs. “Inventor is saving us money because we don’t have to make many changes to tooling,” concludes Bakker. “Without Inventor, this project wouldn’t have been possible.”

## Learn More

To find out how Autodesk solutions for Digital Prototyping can help you complete transportation industry projects faster and at a lower cost, visit [www.autodesk.com/commercial-recreational-transportation](http://www.autodesk.com/commercial-recreational-transportation).



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—Richard Schulz  
Managing Director  
ADEPT Airmotive

Images courtesy of ADEPT Airmotive.

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