

AEROSPACE AND DEFENSE

CycloTech

Leveraging the full potential of configuration management to accelerate the design and release process by 20 percent

Products

Teamcenter, Simcenter, NX

Business challenges

Develop omnidirectional aircraft propulsion system

Optimize thrust generation capabilities

Build and test technology demonstrators

Fill gaps in flight physics simulation

Improve collaboration among dispersed engineering teams

Keys to success

Use NX X for 3D design and enhanced collaboration

Use Simcenter 3D for structural analyses and to facilitate certifications

Use Teamcenter X built-in best practices to get started quickly

Leverage Siemens startup program

Results

Accelerated the design and release process by 20 percent

Created omnidirectional air mobility propulsion system

Established closed-loop engineering

CycloTech uses Siemens Xcelerator to create omnidirectional air mobility propulsion system

A new era for aircraft propulsion

Soon small autonomous flying craft propelled by electricity are expected to be used for transporting goods and passengers, circumventing congested streets in urban areas and revolutionizing short-range transport. There are two main reasons the skies are not yet crowded with these innovative flying transport systems: Regulatory requirements need to be met to uphold air traffic safety, and the vast size and poor

energy efficiency of the helicopter rotors and ducted propellers typically used in the design of this kind of craft.

Cycloidal rotors with blades arranged parallel to the axis of rotation offer several advantages over the more traditional propulsion systems. CycloRotors generate thrust in any direction normal to the axis of rotation by altering the pitch of the blades as they transit around the central axis. By varying the phase of this pitch, the thrust vector can be shifted at any angle. Since blade pitch adjustments involve little inertia, this is fast and efficient, allowing almost instant 360° thrust vectoring.



Six CycloRotors in two orientations give CycloTech's BlackBird technology demonstrator full spatial maneuverability, even in confined airspace and adverse weather conditions.

Results *(continued)*

Built digital twin of engines and craft to reduce reliance on physical prototypes

Improved data consistency

CycloTech GmbH (CycloTech) designs and builds the CycloRotor propulsion technology for the aviation industry. Ideal for electric vertical takeoff and landing (eVTOL) the CycloRotor offers new capabilities for aircraft. In early 2025, the BlackBird demonstrator which is used to showcase the CycloRotor flight capabilities made its maiden flight.

"We have no intention to enter the market of autonomous aerial vehicles," says Marcus Bauer, chief executive officer (CEO) of CycloTech. "We see ourselves as a provider of electric aviation propulsion systems. The BlackBird is an easy-to-understand technology demonstrator for our CycloRotor technology, which our engineers will continue to develop to market maturity."

To help achieve these goals, CycloTech implemented Siemens Digital Industries Software's Simcenter™ NASTRAN software, NX™ X software and Teamcenter® X software, part of the Siemens Xcelerator business platform of software, hardware and services.



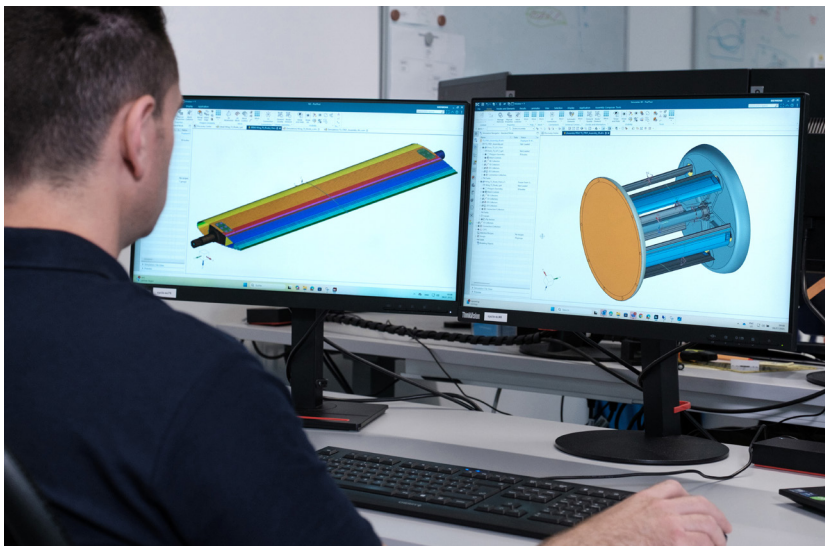
CycloTech designs and builds CycloRotors in various sizes and customized designs as an energy-efficient and versatile omnidirectional air mobility propulsion system.

CycloTech intends to manufacture cyclo-rotors in various sizes and customized designs for diverse applications in urban and regional air mobility. This is not limited to main drives for eVTOL aircraft, airships or drones. Like the Voith-Schneider propeller, a similar design used in shipbuilding to improve maneuverability, CycloRotors can be used as auxiliary drives; for instance, to control cargo balloons or stabilize and position payloads during helicopter transport.

Optimizing CycloRotor design

The BlackBird is fitted with six CycloRotors in two orientations to give the craft full spatial maneuverability, allowing for vertical takeoff and landing, hovering with a pitch angle, midair braking, parallel parking and precision landing even in confined airspace and adverse weather conditions. They are CycloTech's seventh generation of this innovative design, and the result of nearly 15 years of technological development, wind tunnel testing and more than 800 flights of previous technology demonstrators.

There have been attempts to use cycloidal propulsion systems in aviation for more than a century – all not successful. But



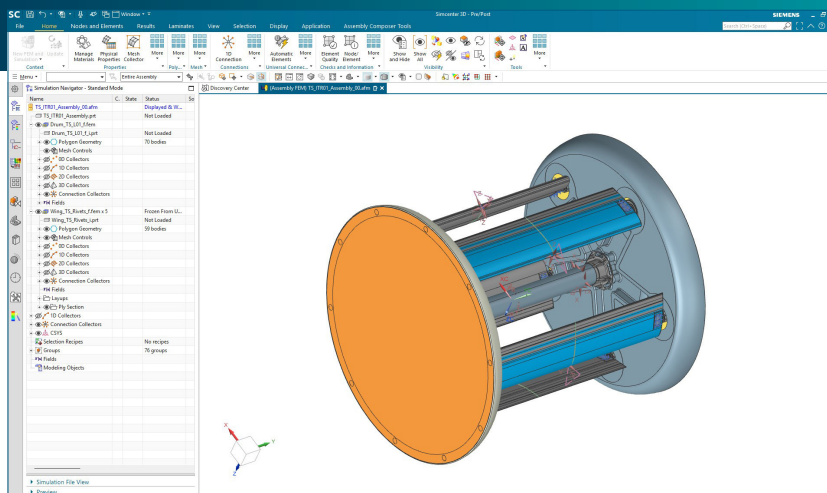
In pursuit of end-to-end data consistency and streamlined engineering processes, CycloTech uses Siemens Xcelerator to unify the software landscape.

with current advances in technology, lightweight materials and real-time control capabilities the knowledge is available today. "Another significant difference is that we can use sophisticated software tools for design, simulation and information management," says H. Tahsin Kart, chief technology officer (CTO) of CycloTech. "We can create the digital twin of each design and perform verification in numerous iterations without the expense of building and destroying physical prototypes."

Design with end-to-end data consistency

CycloTech is experiencing rapid growth. Arguably the world leader in the development of CycloRotor technology, the engineering company based in Linz, Austria, recently opened a subsidiary in Munich, Bavaria. This free state in the south of Germany is a leading aerospace and automotive region, with a multitude of original equipment manufacturers (OEMs) and suppliers as well as universities and research institutes covering the entire value chain. The company employs 65 engineers from 30 nationalities across its two locations.

For quite some time, they used computer-aided design (CAD), product lifecycle management (PLM) and simulation



CycloTech engineers use Simcenter 3D for structural analyses, and Teamcenter X Essentials to exchange engineering data in native file formats from CAD to various forms of simulation and verification and back again.

software from different suppliers. In pursuit of end-to-end data consistency and streamlined engineering processes, they unified the software landscape. "Using Siemens Xcelerator, our engineers weave a digital thread throughout all design and simulation phases," says Kart. "This facilitates continuous improvements and optimizations in a closed-loop design environment."

For this purpose, CycloTech and Siemens jointly developed a roadmap and a future solution architecture, reflecting CycloTech's growth as well as its evolving product development needs. This plan integrates

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Roey Ephstein
Head of Mechanical and Structural Engineering
CycloTech



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Roey Ephstein
Head of Mechanical and Structural Engineering
CycloTech

"Teamcenter X Essentials allows us to fully exploit the potential of configuration management along the entire tool chain. It is really too early to cite numbers, but we expect an acceleration of the overall engineering design and release process by at least 20 percent."

Marcus Bauer
Chief Executive Officer
CycloTech

global experience and best practices, which Siemens has gathered in numerous aerospace and defense startup projects and in major customer programs and international initiatives. This enables CycloTech to leverage Siemens Xcelerator to provide the required agility, speed and scalability.

CycloTech engineers use NX X Design Premium for CAD. This prepackaged solution delivers the CAD capabilities of NX on the cloud. "Using cloud-based engineering software, our engineers can collaborate freely across the various locations," says Kart. "It also saves us the effort to provide IT expertise to support our technical software landscape."

For structural analyses of their designs, CycloTech engineers use Simcenter 3D with the Simcenter NASTRAN solver. "NASTRAN code is what the regulators prefer, so this is important for future certifications," says Roey Ephstein, Head of Mechanical and Structural Engineering at CycloTech. "With the embedded Simcenter NASTRAN solver, Simcenter 3D allows us to create all that's required for certifications as an integral part of our closed-loop engineering process."



CycloRotors are not limited to applications like the main drives for eVTOL aircraft, airships or drones, but can be used as auxiliary drives. For instance, to stabilize and position payloads during helicopter transport.



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Chief Technology Officer
CycloTech

Solutions/Services

Teamcenter X
siemens.com/teamcenter-x

Simcenter
siemens.com/simcenter

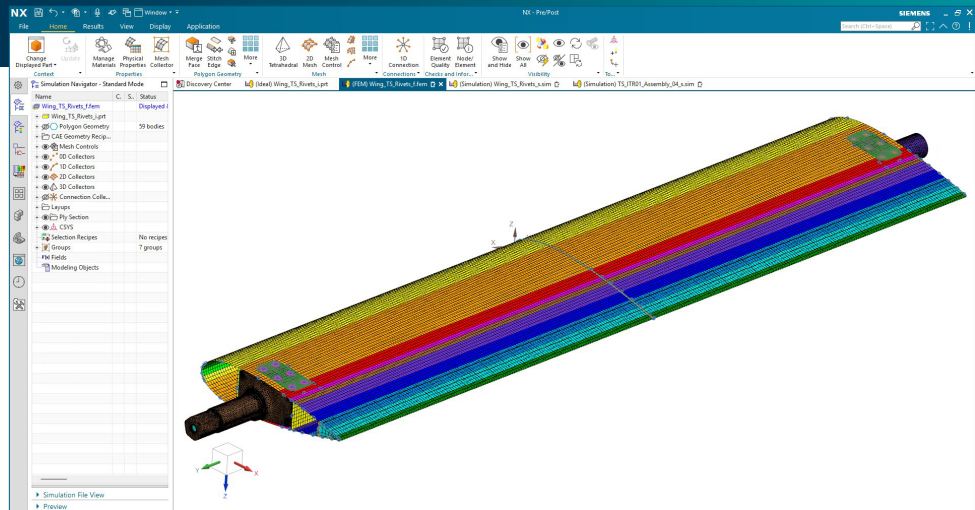
NX X
siemens.com/nx

Customer's primary business

CycloTech is an Austrian engineering company with a subsidiary in Munich, Germany. Its 65 engineers of 30 nationalities design and test the CycloRotor technology, an electrically powered propulsion system for aviation. cyclo.tech.at

Customer location

Linz
Austria



CycloTech engineers use NX X Design Premium for computer-aided design (CAD) and embedded finite element model analyses.

Fast forward to the future

Although CycloTech has been in business since 2004, the company was also able to leverage Siemens' startup program. Siemens supports startup companies with scalable, low-cost design and simulation engineering solutions and credits for one of the leading cloud service providers. This facilitated a rapid and smooth implementation of PLM software as a digital information backbone for the company's engineering.

CycloTech uses Teamcenter X Essentials for PLM. This cloud-based software-as-a-service (SaaS) delivers the full Teamcenter PLM portfolio. With built-in best practices and reduced cost of ownership, it helps companies to get started quickly. As with NX X, all the operations and maintenance, including updates, are managed by Siemens. "Teamcenter X Essentials allows us to fully exploit the potential of configuration management along the entire tool chain," says Bauer. "It is really too early to cite numbers, but we expect an

acceleration of the overall engineering design and release process by at least 20 percent."

"To a great extent, the expected benefits are due to the open Siemens Xcelerator platform with its common database and interfaces, which provide improved data consistency for all information," adds Ephstein. "For example, engineering data travels in native file format from CAD to all the various forms of simulation and verification and back."

The company is planning to upgrade to the full version, as Siemens provides a preconfigured aerospace and defense template. This will allow CycloTech to benefit from Siemens' leading-edge technology and expertise in its aerospace and defense customer base, further minimizing risk and shortening time-to-market for the first commercially available CycloRotor products.

Video: <https://youtu.be/oRzr1DtMPXY>

Siemens Digital Industries Software

Americas 1 800 498 5351
Europe 00 800 70002222
Asia-Pacific 001 800 03061910
For additional numbers, click [here](#).

siemens.com/software

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