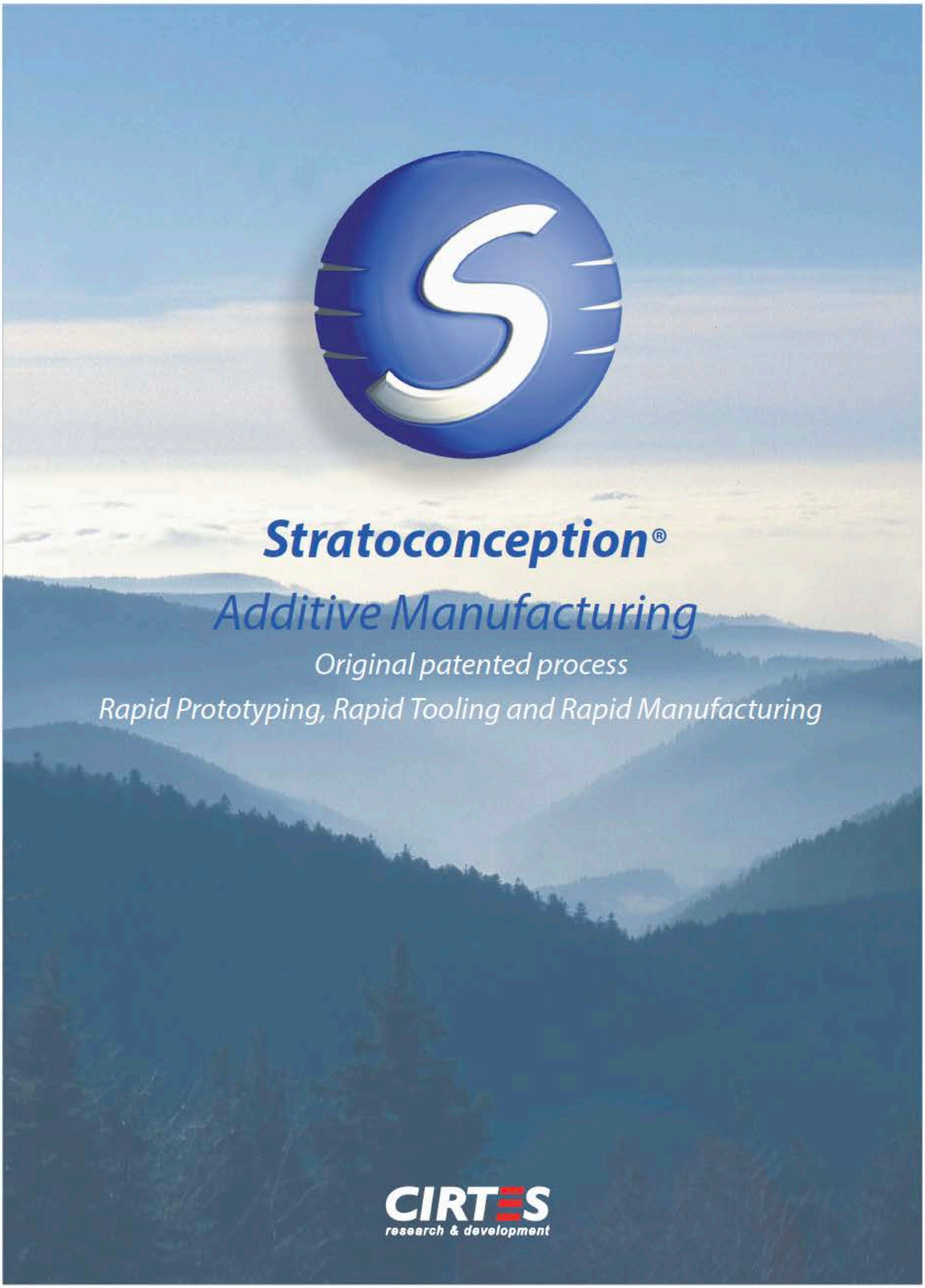


Stratoconception®

Additive Manufacturing

Original patented process

Rapid Prototyping, Rapid Tooling and Rapid Manufacturing

CIRTES
research & development

Saint-Dié-des-Vosges France

THE PROCESS

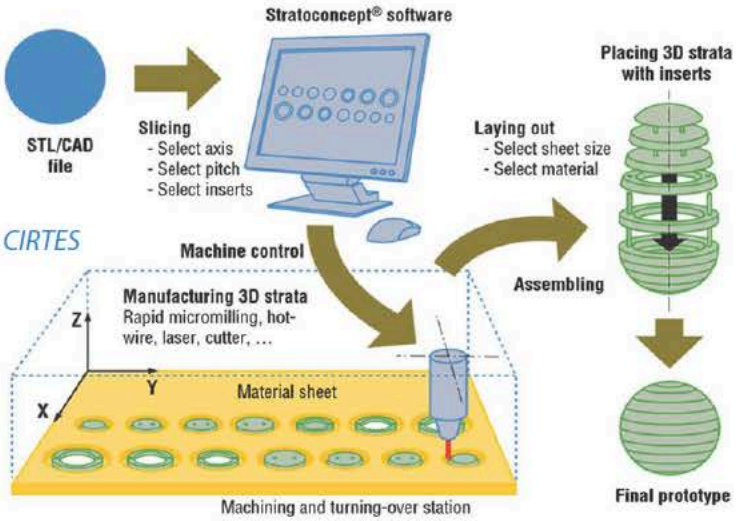
The origin of the research

The research team headed by Professor Claude Barlier has been working since the late 80s to develop the Stratoconception® process, which is protected by international trademarks and patents.
Stratoconception® is an Additive Manufacturing process that enables an object designed in CAD to be manufactured, layer by layer, without any break in the digital chain.
The process consists in automatically breaking down the object into a series of complementary elementary layers called strata, into which stiffeners and positioning plugs are placed. All pieces of these strata are directly nested, then manufactured by rapid micro-milling, laser cutting, wire cutting, cutter or any other cutting method from any sheet material. All these elementary parts are then fitted together by positioning plugs, bridges or interlocking elements and assembled to reconstitute the final part. The assembly of strata is taken into account right from the design stage, to ensure resistance to mechanical stress during use. Inserts serve both as positioning plugs and as links between strata. In the case of thin-walled parts, they are placed on the outside of the part by means of breakaway bridges. In some cases, it is also possible to interlock strata and to incorporate channels, cells, buses or even to embed sensors.

The process is fast, with no restriction on shape, material or size. It enables the manufacturing of massive parts with undercuts that could not be produced using conventional processes. It can be used for applications either in prototyping, tooling and rapid manufacturing. Since the origin of the process, the CIRTES team has been working on its fine-tuning and further development. To date, 19 patents and 8 trademarks have been registered internationally and numerous papers have been published.

The original patented process

Stratoconception® process
Patents and trademarks C. Barlier, CIRTES
Saint-Dié-des-Vosges
France



Software development for the Stratoconception® process is entirely controlled and carried out by CIRTES, owner of the source code. This has led to the development of various products and business

StratoPRO concept®	StratoLT concept®	StratoVR concept®	StratoHW concept®
Industrial version	Starter version	Prototyping at school	Large polystyrene pieces
OrthoStrato®	StratoTOP CONCEPT	TopSolid Strato	Pack & Strat®
Orthopedics sector	Industrial version	Plug in to Top Solid	Packaging





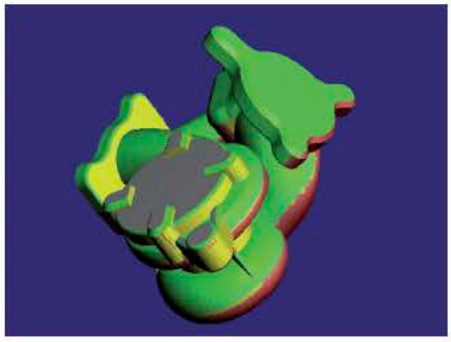

Stratoconcept®

THE SOFTWARE

With its simple and intuitive interface, Stratoconcept® software implements the latest developments of the Stratoconception® process. All phases of development - from the STL model (rapid prototyping standard) to the machine code driving 3D cutting - are accessible and configurable (model, slices, layers, toolpaths, machine code). This structure makes it possible to act at every stage to create a true "design" in the production of a Stratoconception® prototype or tool.

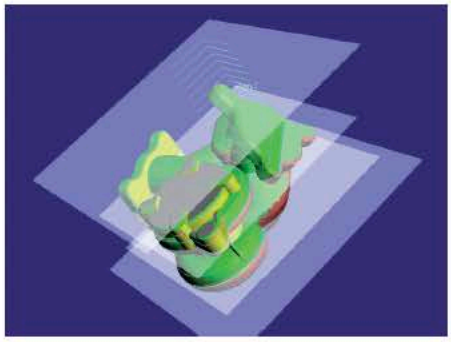
Viewing and modifying STL Files

- Import/Export files in **STL** format and consistency analysis
- **Advanced viewing** (rendering mode, wireframe, material, ...)
- **Correction of STL models** (automatic or manual)
- **Modification of STL models:** transformation, simplification or enrichment of the mesh, cutting, creation of a footprint, ...
- Dimensional measurements



3D Slicing

- Automatic or manual choice of the **slicing axis**
- **Setting of slicing planes** at the appropriate locations on the model
- Choice of qualified material for Stratoconception® in the **database** for the definition of tool/material pairs for machining

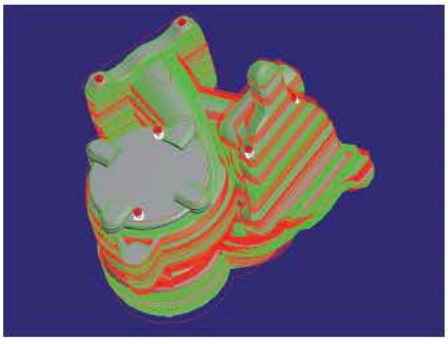


Assembly

- Mouse setting of **positioning inserts** for massive parts
- **Bridges** for transparent or thin-walled parts
- **Interlocking** for easy assembly

Stratification

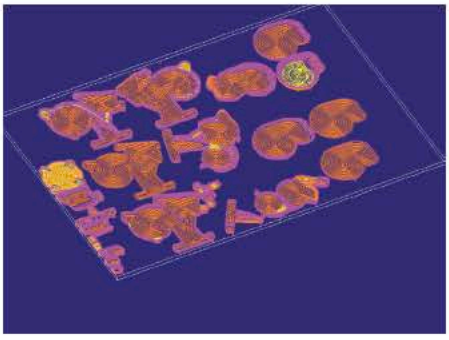
- Precision and speed of production under control thanks to the **adaptive stratification**
- Complex shapes can be produced thanks to the **turning-over** and the **double-sided** machining



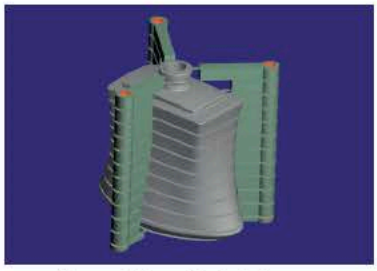
THE SOFTWARE

Manufacturing

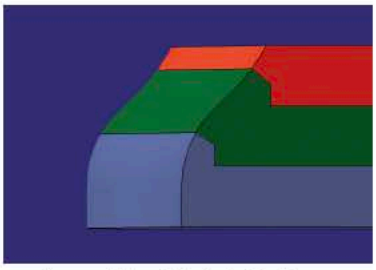
- Definition of **tools and cutting parameters** from the database
- **Optimized layer nesting to save material**
- Automatic generation of double-sided **tool paths** (cutting, facing milling, drilling of insertion holes, moving)
- **Manufacturing report:** printing for the monitoring and traceability of the prototype



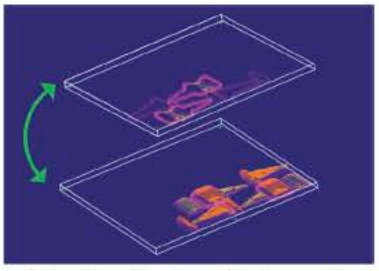
Major patented innovations



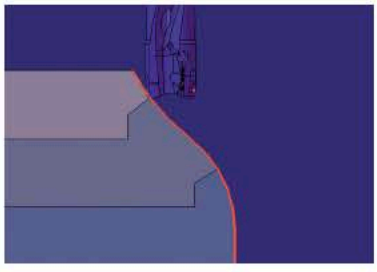
Assembly with bridges



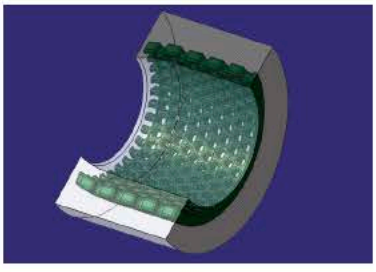
Assembly with imbrication



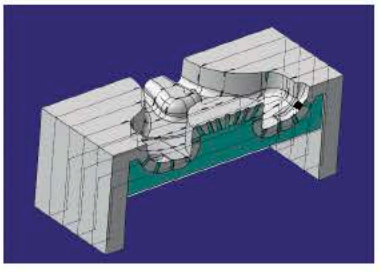
Double-sided machining with overturning



Stacking/finishing of interstrates



Thermal cells



Interstrate nozzles

References

Over 800 solutions installed worldwide

French and foreign companies: PSA/Stellantis, STEELCASE, DAUM,SAINT-GOBAIN PAM, CATOIRE SEMI, FERRY CAPITAIN, SAFRA, Fonderies de BROUSSEVAL et MONTREUIL, LIEBHERR, PHILIPS, AIRBUS, AUROCK, MONTUPET, JOHNSON CONTROL, TSA INOX, CONSTELLIUM (Switzerland), RIBERMOLDE Lda (Portugal), BRUNS (Netherlands), ROTO (Slovenia), TECH•IZ (South Korea),SAM KWANG STRATES (South Korea), BAZ (Russia), POLLES (Italia), BUGATTI, CDTA (Algeria), ALMAY, FAHLER, EDF, SNCF, ARIANE GROUP, SAFRAN, ATLANTIC, VKI, TOPSOLID, CROMA, WEISROCK, HOUOT, MECANUMERIC, BREDOK, ..CE .

Training institutions: Technical high schools and colleges, ENSAM, Mines de Douai, ENIM, ESIEC, Polytech Nancy, ENSHMG, IFTS, CNRS, CEMES, Ecole Supérieure d'Arts Plastiques (Monaco), Oundle School (England), Essen University (Germany), ENIM Rabat, ENSA Marrakech, ENSA Tanger (Morocco), ENSET Oran, ENP Algiers (Algeria), ENIS, ENIT (Tunisia), ENSAN, Haute Ecole des Arts du Rhin, ...






An industrial reality

THE APPLICATIONS


Turbine blade - Strat'ORA


Geometric prototype
Zodiac Aerospace


Vase in PMMA - Baccarat


Instrumented measurement bust - ENEDIS


Architectural model
ENSAN - StratoBois


Steam generator model
- FRAMATOME


Rafale - DASSAULT AVIATION


Strat®Art armchair - CIRTES


Madonna of Dangolsheim

Mock-ups and prototypes

for activity sectors

Automotive
Aeronautics
Railway
Space
Architecture
Public Building
Household appliances
Packaging
Energy
Luxury
Glass
Crystal glass
Medical
Furniture
Sculpture
(...)

Models and tools

for processes

Foundry
Plastics processing
Forging
Stamping
Glass shaping
Concrete shaping
(...)


Thermoforming


Plastics injection moulding
Antiope


Sand casting - FBM


"Magnum" Tiger - Daum


Injection blow moulding
Vegetal & Mineral Water


Concrete casting
PEDUZZI / LIVIO


Sand casting
Saint-Gobain PAM


Polystyrene injection moulding - PSA


Contact moulding
Equip'AERO

Freedom in prototyping

THE PRODUCTS

A wide range of Stratoconception® products

CIRTES offers a complete range of products for making models, prototypes, parts, models and tools:

- Specific stations dedicated to the process based on micro-milling, hot wire cutting and cutter cutting machines,

- Specific equipment for the Stratoconception® process to hold panoplies during machining, assembly and finishing of strata,

- Integration of the process on existing machinery,

- Services (hotline, training...),

- Complete range of software based on Stratoconception® process,

- Specific developments dedicated to business applications (Pack&Strat®, PMMA,...).

CIRTES research & development

CIRTES, in Saint-Dié-des-Vosges, France, at the heart of Europe

CIRTES is an accredited contract research organisation. Located in the heart of the Saint-Dié-des-Vosges industrial estate since 1991, CIRTES also has a site in Carmaux, in South-Western France.

Based on its patented specialities: Additive Manufacturing by Stratoconception®, Pack&Strat® 3D Rapid Packaging and Actarus® Machining Monitoring, CIRTES aims to develop industrial Research & Development contracts, manufacture models and tooling and market software solutions and associated machines.

Cirtes, Innovation through Research and Development

CIRTES carries out R&D projects in its core areas of expertise: Stratoconception®, Pack&Strat® and Actarus®.
Its R&D contracts cover various sectors of activity. CIRTES current contracts include PSA/STELLANTIS and BUGATTI for the automotive industry, Charpente HOUOT and WEISROCK for the wood industry, SAINT-GOBAIN PAM, BROUSSEVAL and FERRY CAPITAIN for the foundry industry, AIRBUS, ARIANE Group, MECACHROME and REALMECA for aerospace and defence industries, FRAMATOME and EDF for energy, TOPSOLID and MECANUMERIC for CAD/CAM and machinery, ...

www.stratoconception.com ***www.cirtes.com***

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