

# Best practice: lightweight prototypes

## Challenge

- + Composite structure and design model of silent air taxi with hybrid electric drivetrain
- + Innovative BoxWing structure
- + Aero-acoustically optimized design of the entire aircraft
- + Production and assembling

## Approach

- + Design of lightweight structure
- + Production of tools and parts
- + Assembling and finishing
- + Less energy for transportation
- + Ultra low-noise fan

## Results

- + Approved design concept
- + Structural production concept
- + Duration: 6-8 weeks



# Best practice: lightweight components

## Challenge

- + Lightweight composite structure and design
- + Engineering, tooling and production

## Approach

- + Design of lightweight structure
- + Process and tool development
- + Laminate lay-up and characteristics
- + Production of tools and parts
- + Assembling and finishing

## Results

- + Approved design concept
- + Structural production concept
- + Full functional & design components



Clips & Springs



Profile Systems



Sandwich Systems



Curved, non constant



# Best practice: tooling for composites



CNC tool production



Vacuumthermo Systems



Vacuum Systems



Preform Systems

## Challenge

- + Efficient tool systems for prototypes and small series production
- + Process evaluation and testing

## Approach

- + Process and tool development
- + CAD design and optimization
- + CNC tool production
- + Material grade in dependence of part quantity
- + Heated flexibel membrane and pressure systems (out of autoclav) for constant quality of produced composites

## Results

- + Finished tool system for prototype production
- + Vacuum thermoforming and preform tools
- + Segmented tool systems
- + Variothermal process (SPS controlled)

# Best practice: From Sketch to Prototype

## Challenge

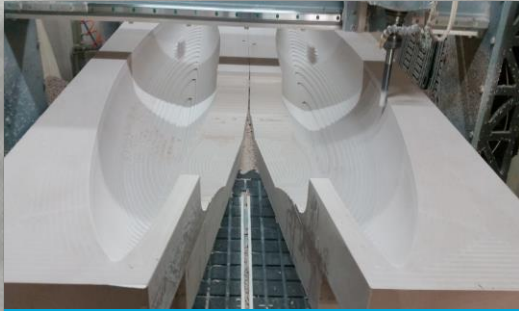
- + Efficient tool system and prototype production for project testing and presentation

## Approach

- + Technical requirements
- + Detailed design concept
- + CAD modelling
- + Tooling/ CNC machining
- + Part production
- + Assembling
- + Finishing

## Results

- + Development and production
- + Ready for tests and presentations
- + Duration of 6-8 weeks



CNC tool production



Composite production



Assembling



Finishing





## Best practice: Self-driving transport unit

### Challenge

- + Development of an autonomic transport unit with cargo space and outer composite shell parts, which fits a defined number of standard transport boxes
- + Build up of two prototypes who serve both, design and functional evaluation of the concept

### Approach

- + Aluminum profiles and steel parts to form a skeletal structure
- + GFK, CFK and 3D printed plastic components to minimize weight
- + Slidable carrier construction to optimize the use of storage in a defined build space

### Result

- + Definition of customer requirements, generation of CAD-data and build up of a prototype
- + Test of the prototype under real conditions in a field test over a period of two months



# Best practice: Automated driving of a shuttle vehicle

## Software development



## Vehicle test and validation



## Demonstrator



## Challenge

- + Software and functional development for the automation of a shuttle
- + Lightweight composite parts and components
  - Battery safety cover & intrusion provider
  - Free shaped GFK cockpit and panels

## Approach

- + Specification and elaboration of hardware components, of the E/E architecture and of the safety concept for automated driving
- + Software and functional development
- + Engineering and lay-up definition for composites
- + Structure- and Design-Part production
- + Design, development and production of tools and composite components
- + Installation of the software, sensors and actuators, and commissioning of the automated system
- + Development of a basic GUI

## Result

- + Automated driving shuttle vehicle