Introduction

1. TiGL Workshop, September 11 / 12, Cologne

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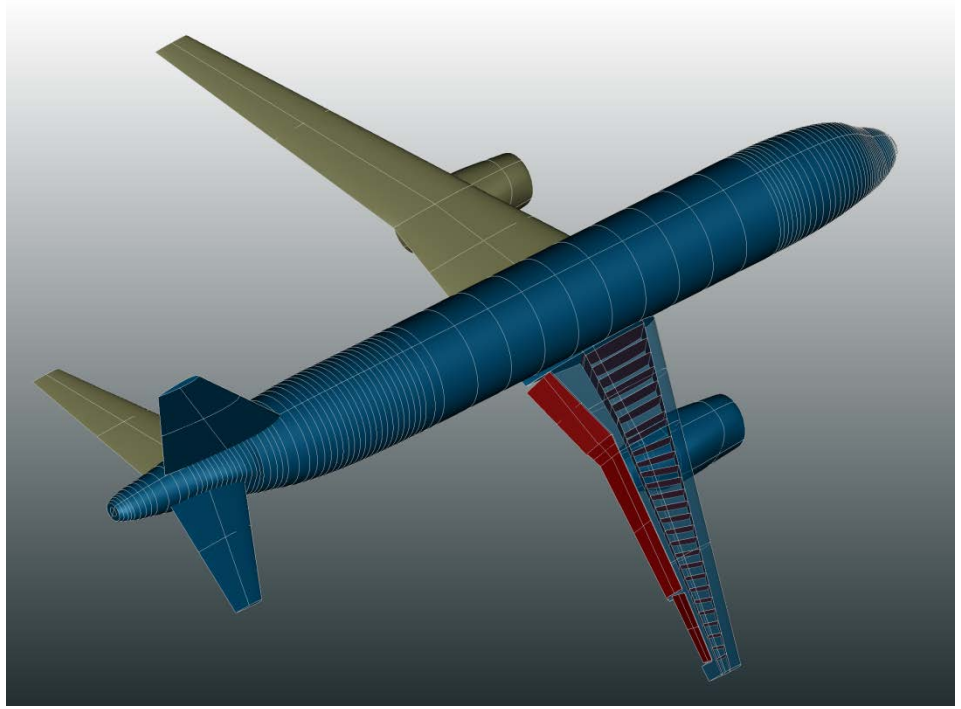
German Aerospace Center

Welcome!



Goals of this workshop

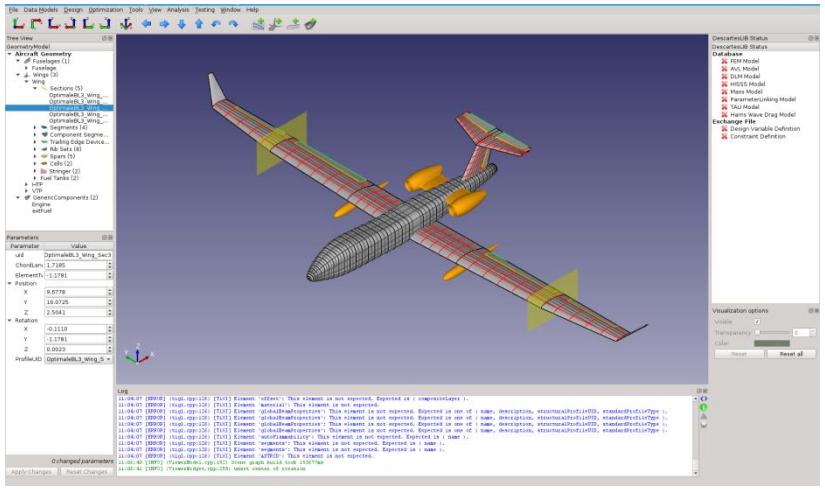
- We want to get to know you, the users
  - We don’t know all our users and their use cases
- We want to show you our new features
  - There have been many new developments in TiGL, some of which you may be unaware off
  - There are new ways to use TiGL, giving you greater flexibility → Internal Python API
- We want to identify problems
  - Are there any current issues that we should know about?
  - Are there any features that would really simplify your life with TiGL?

Agenda

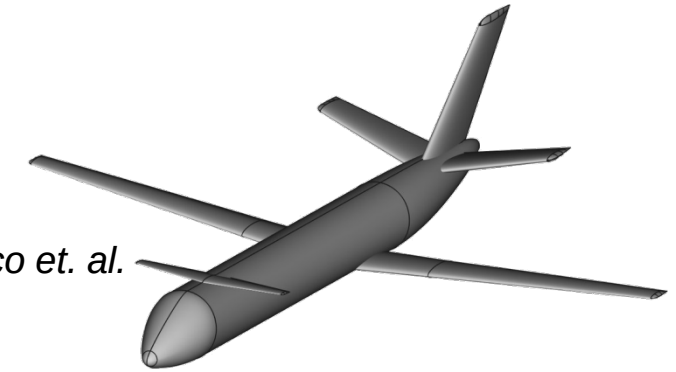
Sept. 11.	13:00 – 13:15	Introduction
	13:15 – 13:45	Introduction of Participants
	13:45 – 14:15	Agostino De Marco - *Aircraft design tools developed at the University of Naples Federico II and their integration with DLR software*
	14:15 – 14:30	**Coffee Break**
	14:30 – 16:00	Python API + Hands On: Basics
	16:00 – 16:30	**Coffee Break**
	16:30 – 17:00	Python API + Hands On: Customization and Visualization
	17:00 – 18:00	TiGL Viewer Scripting API + Hands On
	19:30	**Social Event Eltzhof**
Sept. 12.	09:00 – 09:30	Sebastian Deinert - *Descartes – Parametric Analysis Model Generation Using CPACS and TiGL*
	09:30 – 10:00	Merlin Pelz - *Curve Network Interpolation with Gordon Surfaces*
	10:00 – 10:15	**Coffee Break**
	10:15 – 11:00	Python API + Hands On: Custom Geometry
	11:00 – 12:30	How to Contribute + Hands On
	12:30 – 13:30	**Lunch**
	13:30 – 14:00	Individual Q&A
	14:00	**Wrap-Up**

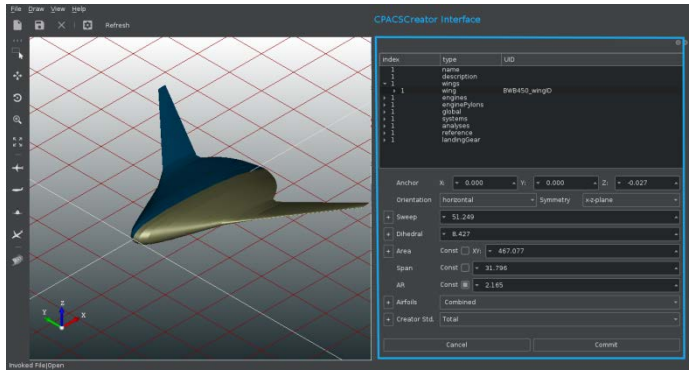
CPACS + TiGL Ecosystem is growing

Descartes,
Airbus + RISC

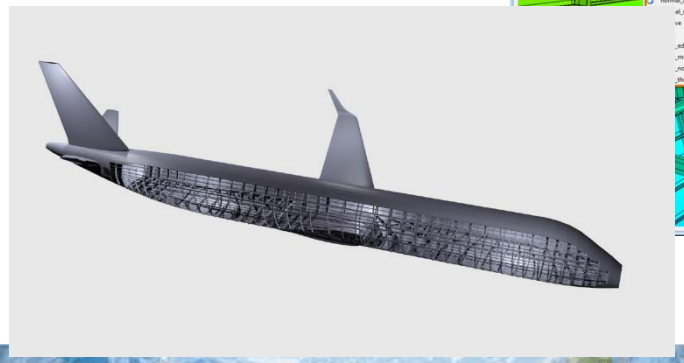


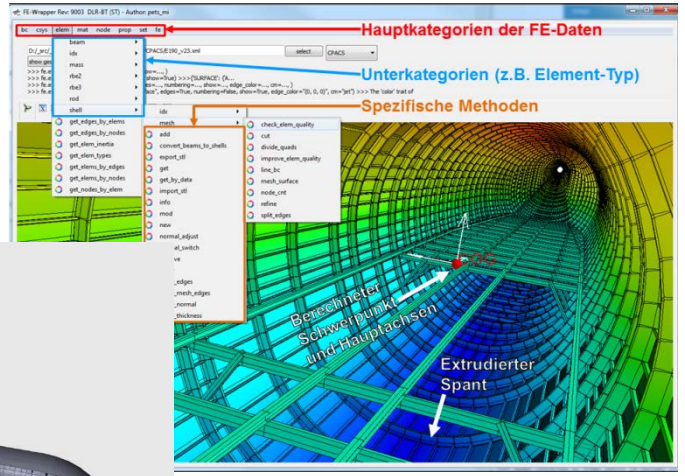
JPAD,
de Marco et. al.





CPACS Creator,
CFS Engineering

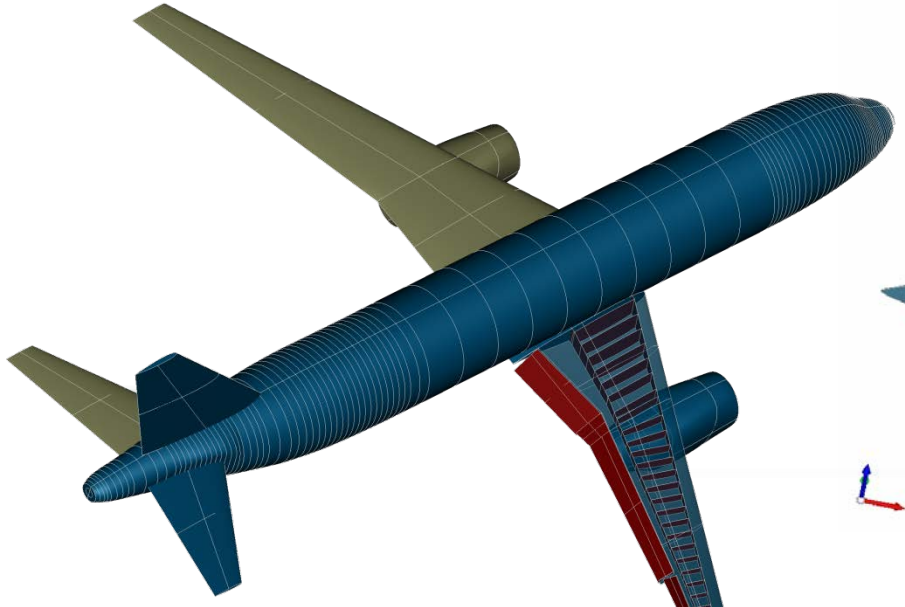


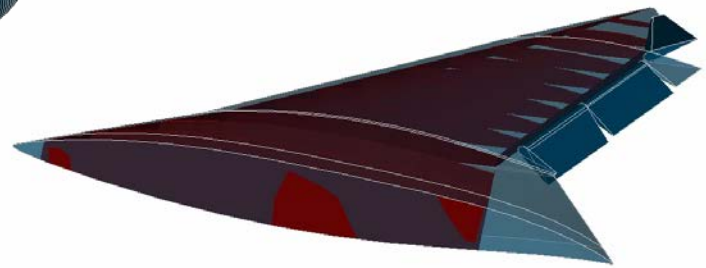


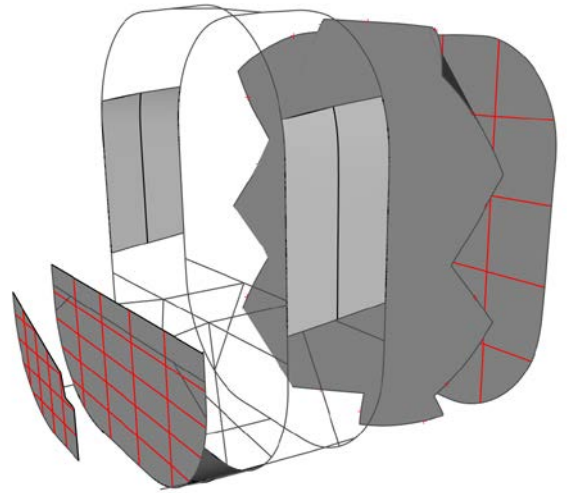
Pandora,
Petsch, Kohlgrüber

TiGL Geometry Library - Current Status

- Many new geometries:
  - Flaps and Control Surfaces
  - Wing structural elements
  - Wing cells
  - Engine nacelles (WIP)
  - Engine pylons (WIP)
  - Fuselage structural elements
  - Rotors (e.g. for Helicopters)
  - Wing Cells







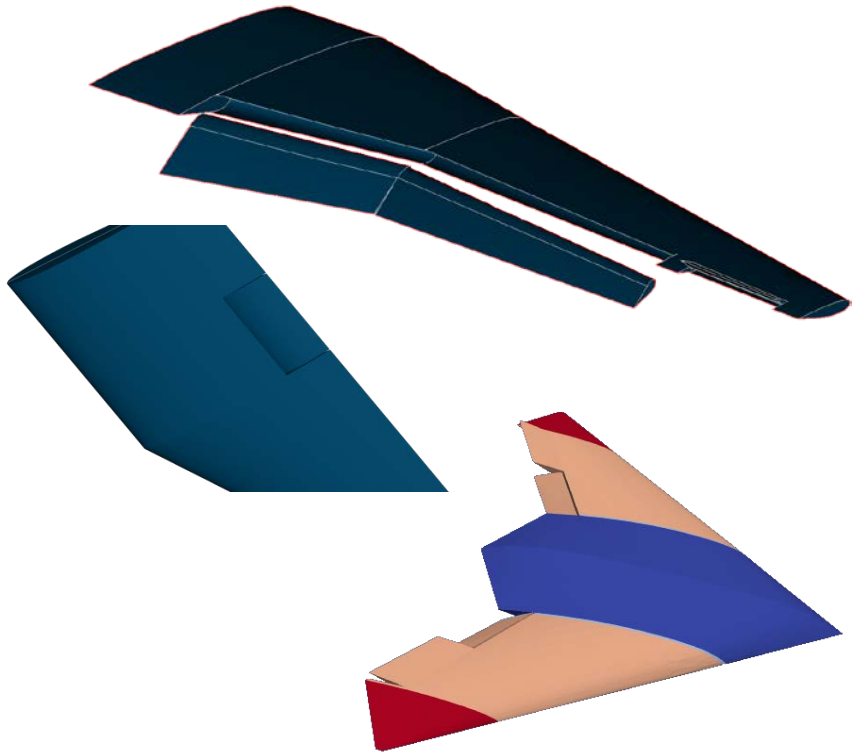
- Large parts developed by AIRBUS DEFENCE & SPACE, RISC Software GmbH
- Automatic C++ code generation from CPACS schema
- CPACS 3 support und cpacs2to3 converter tool

TiGL 2.2.2 + 2.2.3 Release

- Implemented control surfaces devices
  - Trailing Edge devices
  - Leading Edge devices

- New API functions to move flaps

- TiGLViewer:
  - Angle of perspective can be adjusted using the scripting API with `setCameraPosition` and `setLookAtPosition`.
    This allows e.g. to **create videos** of the geometry.



TiGL 3.0 Release Candidate

TiGL 3.0 depends on CPACS 3.0!

- TiGL 3.0-RC1 Release Date: 12/17/2017
- CPACS 3.0 Release Date: 31/07/2018
- TiGL 3.0 Release Date: expected end 2018

- Not backwards compatible to TiGL 2:
  - Cannot read CPACS 2 files
  - API changes

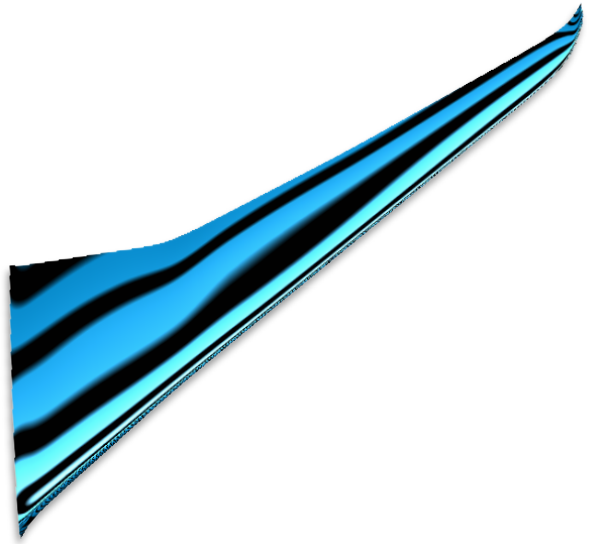
- New Component Segment (CS) definition and associated API functions

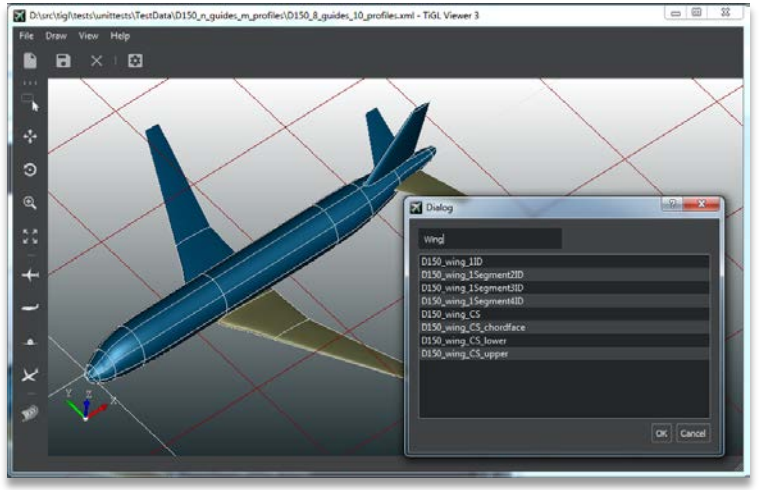
- Guide curve support for wings and fuselages for high-fidelity surface modeling according to the CPACS 3 definition.

- Alternative positioning of geometries either in CS coordinates or in segment coordinates

TiGL 3.0 Release Candidate

- Improved speed of `tiglFuselageGetPoint` function.
- Fully automatic code generation for CPACS reading and writing (in cooperation with Airbus D & S and RISC)
- The wing structure is not yet adapted to CPACS 3 but uses the 2.3 definition. This will be updated in the next release.
- Control surfaces not yet included
- **TiGL Viewer:**
  - New design
  - Display of **reflection lines** to inspect surface quality.
  - Display of **textured surfaces**.





CPACS 2 to 3 Converter

- A python script available on Github and via our conda repository

```
cpacs2to3 myaircraftv2.xml -o myaircraftv3.xml
```

- Currently the script
  - increments the version number to 3
  - adds uiDs that are now required in CPACS 3
  - transforms eta and xsi coordinates to new CPACS definition
  - converts guide curve points to the new CPACS definition

- Geometry related conversions on the To-Do list:
  - Wing Structure

- **Everyone is welcome to participate!**
  - If you need to convert something during your transition to CPACS 3.0, please
    1. Check here if someone else has already implemented this conversion.
    2. Else: Contribute!

- **Ideally, the tool is as complete as it can be.**

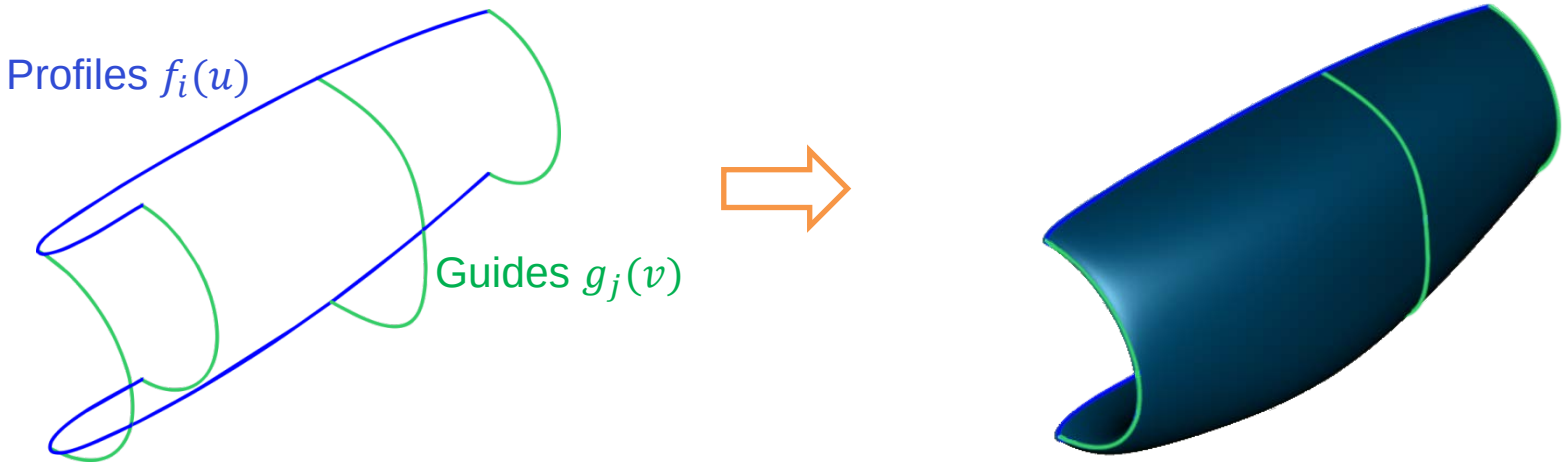
Guide Curves Support

Curve network interpolation with Gordon Surfaces

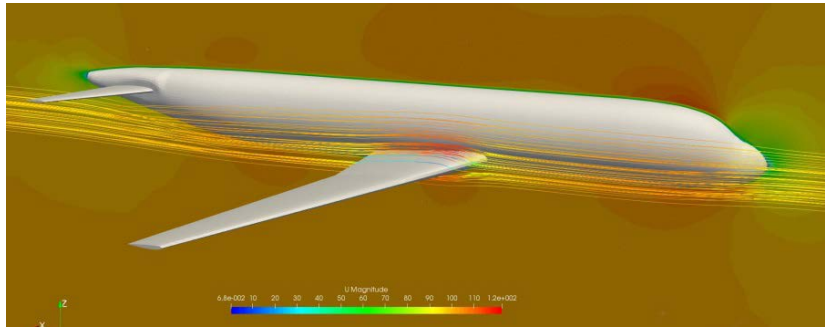
- Given network of profile and guide curves: Find surface that interpolates these curves

- Problem: No free library available for curve network interpolation!
- Custom development from OpenCASCADE for DLR based on Coons-patches showed poor results

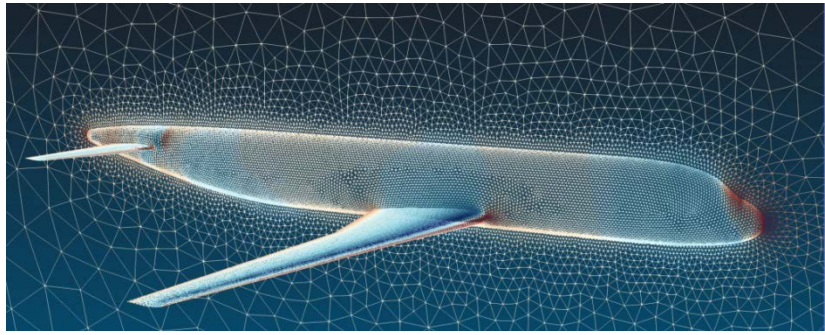
- An algorithm based on Gordon Surfaces is much more promising (→Merlin Pelz)

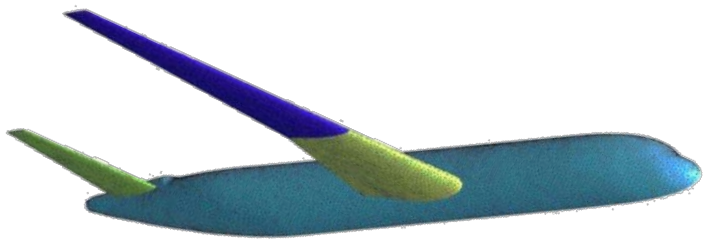


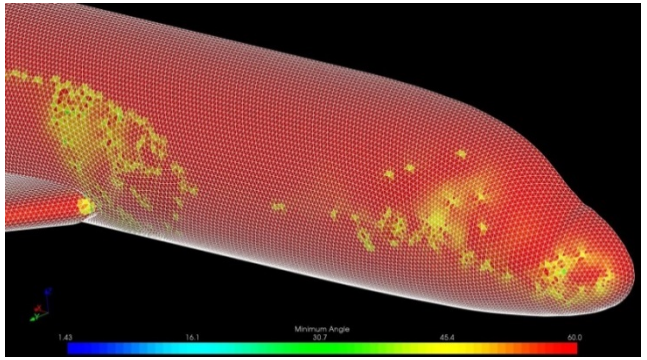
Mesh Creation with TiGL

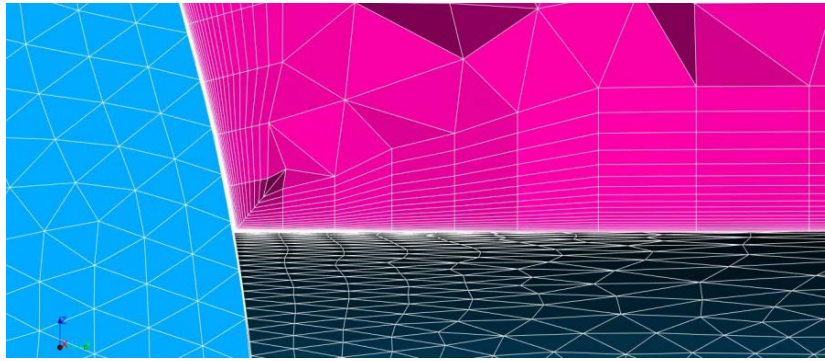


- Current student project (Paul Putin)
- Investigate the possibility of implementing mesh-export functionality
- Goal: Robustly generate a mesh with few options
  - for radar-control analysis
  - for low- to mid-fidelity CFD simulations (e.g. in TAU, OpenFOAM …)
  - as an initial mesh for a commercial meshing tool
- Write wrapper for OpenSource Mesher (Smesh+NetGen, GMsh, …)









Roadmap

TIGL 3.0

- CPACS 3 compatible wing structure
- Replace Coons patch algorithm with Gordon surfaces

TiGL 3.1

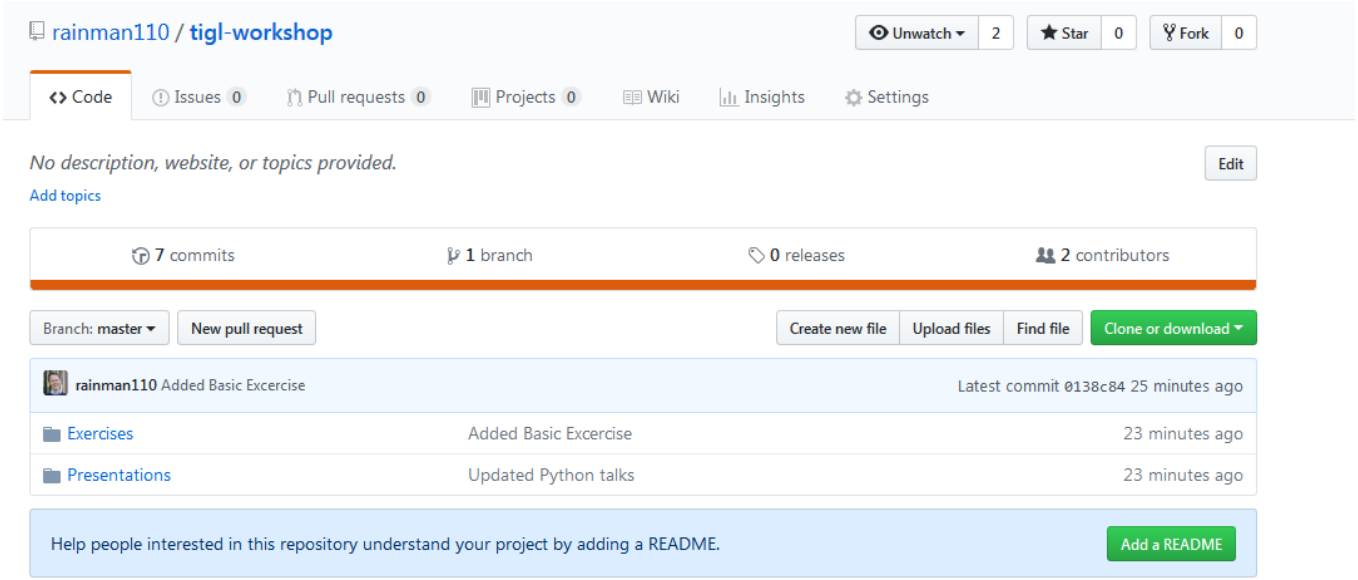
- Re-introduce control surfaces from TiGL 2
- Modelling of Nacelles + Pylon

Future

- Helper geometries for Mesh generators
- Own meshes for mid-fi simulations
- Variable geometries
- Modelling of intakes and channels

Course Material Online

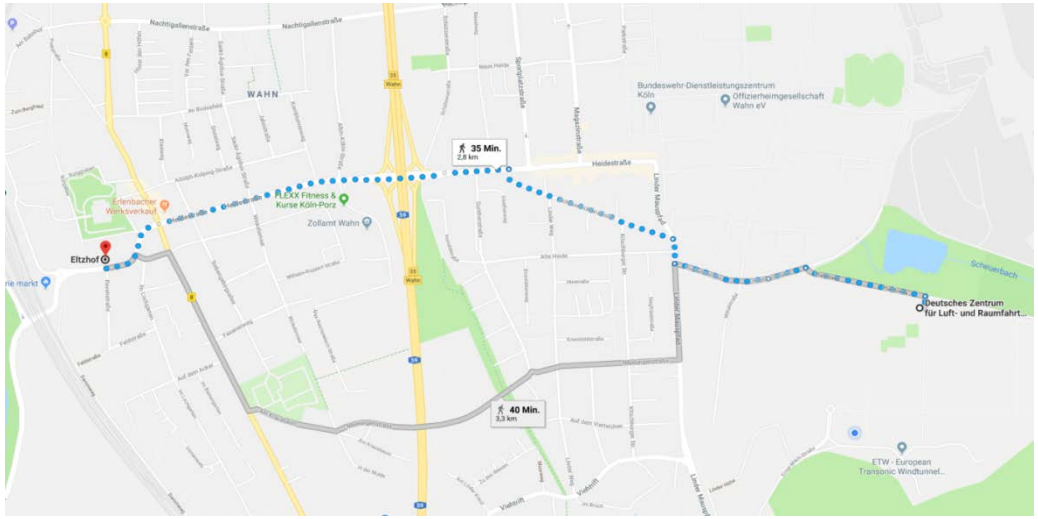
- Download / git-clone the TiGL workshop material from
  - https://github.com/rainman110/tigl-workshop



Social event today

Dinner at Restaurant Eltzhof, Köln-Wahn:

- With Bus 162 from DLR or Bus 160 from Scheuermühlenstr to Wahn Kirche. Then about 300m walking to the Eltzhof restaurant.



Introduction of the participants

- Who are you?
- What are you working on?
- How is your work related to TiGL or CPACS?
- What are your expectations of the next 2 days?