

<http://ewade2013.AircraftDesign.org>
<http://dx.doi.org/10.5281/zenodo.546427>

The New Aircraft Design Course at the Technical University of Munich (TUM)

Sky Sartorius






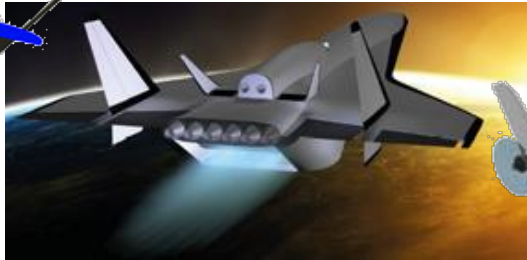


Design at TUM – a broad topic

- Unique boundary conditions at TUM
- Course content/curriculum/scope
- Prescribed design methods and tools
- Course development, (short) history, past years
- Lessons learned
- Future of aircraft design education at TUM

Presentation overview

- Background
- Goals
- Course content
- Moving forward

Background – student exposure to design

Credited coursework	Extracurriculars	Department projects
<p>Aircraft design lecture</p>  <p>New: aircraft design practical course</p> <ul style="list-style-type: none"> • Project-based (learn by doing!) • For advance students – lecture course as prerequisite • <u>Not</u> a compulsory course 	<p>AkaFlieg</p> <p>AkaModell</p> <p>Euroavia/symposium</p>   	<p>Student assistantships</p> <p>Student theses (bachelor, semester, & master)</p>  

Goals – overview

- Goals
 1. Learning value: make each student a capable conceptual designer
 2. Good result: learn by doing... right



- Boundary conditions
 - ‘Customer’-oriented
 - Popular (or else no participants)
 - Appropriate workload
 - ...



Goals – learning objectives

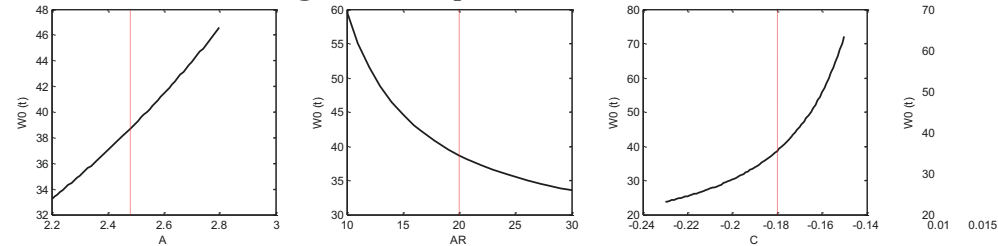
Work in multidisciplinary team



Solve iterative/ open-ended problems



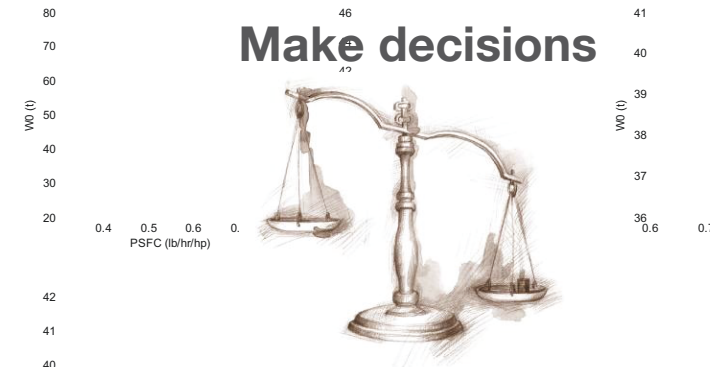
Analyze requirements



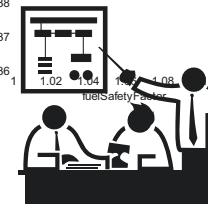
Appreciate history



Make decisions




Communicate



Course content – structure

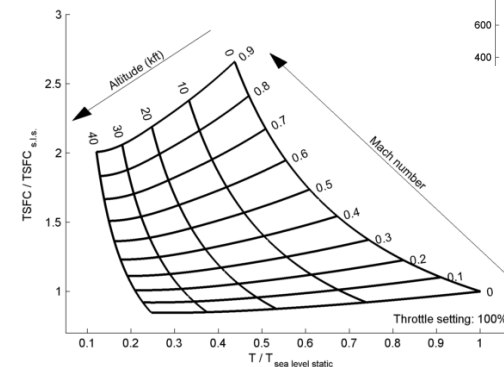
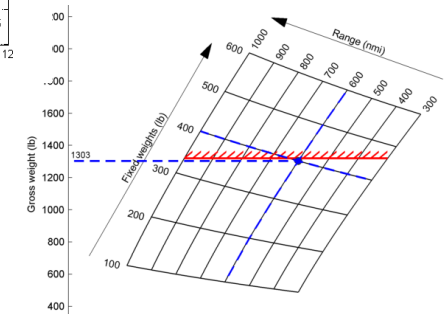
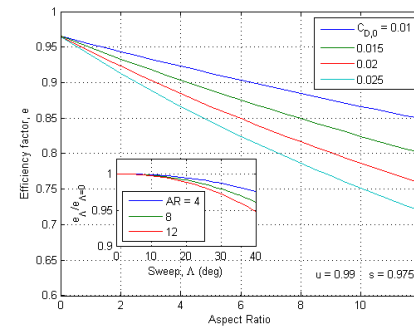
AIAA design task: HALE UAS for missile defence with directed energy laser



Design activity	Weeks	End milestone	4 ECTS / 15 weeks / 3 contact hours/week
Recruiting & selection	~10	Annotated concept sketches	
Design basics & “first shot” design	3	Individual sizing project submission	
Concept exploration Issue reports	3	Initial design review (IDR) 	
Preliminary design	7	Preliminary design review (PDR)	
Refinement	4	Design report submission	
Revision	8	AIAA proposal submission	

Course content – prescribed tools & methods

- **No provided tools!** (almost)
 - But many resources
- Some small exceptions:
 - Cookbook for individual project
 - Cookbook for engine modeling
 - Some basic provided software (but almost all open/free)



Course content – soft skills emphasis

Team environment

- Management
- Collaboration
- Data control
- Specialization

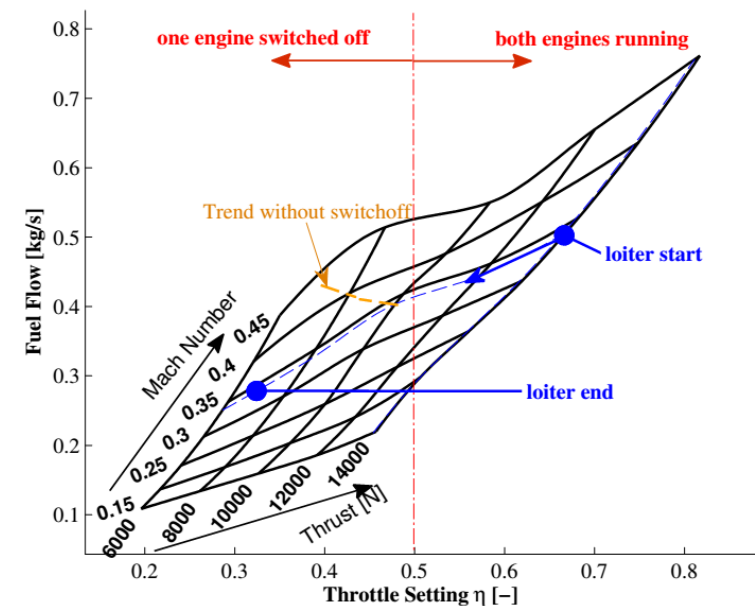
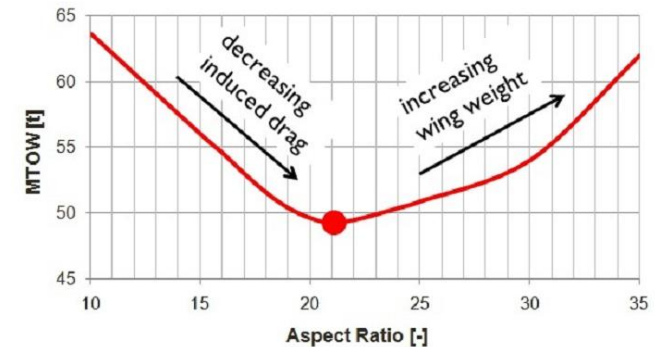
Communication

- Writing
- Technical drawing
- Audio/visual presentation
- Technical conversation

Course content – decision-making emphasis

A good trade study...

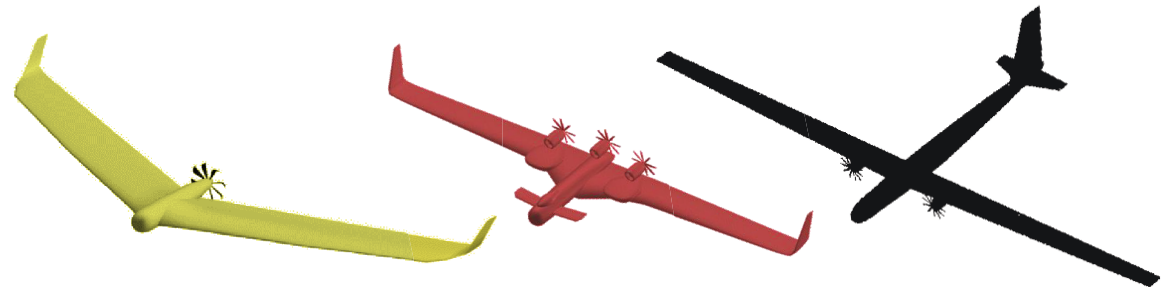
1. is well **chosen**
 - Recognize important trades to be made & where to focus efforts
2. is well **executed**
 - Appropriate tools & methods for study process and technical analysis
3. is well **communicated**
 - Make results clear to the decision-maker and other stakeholders
4. leads to a good engineering design **decision**



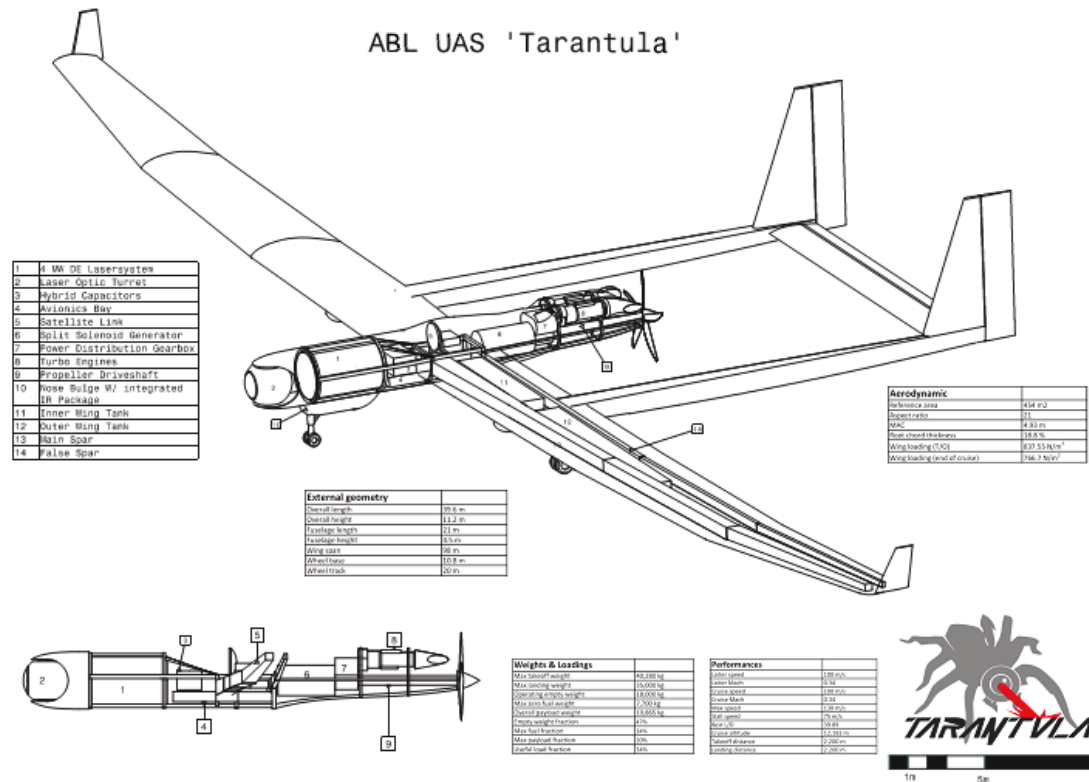
Results

Student feedback:

- “I learned a **LOT!**”
- “I’m proud of our design”
- “It’s too much work!”



ABL UAS 'Tarantula'



AIAA Graduate Team Aircraft Design Competition 2nd Prize



Moving forward

Evolutionary approach: shrink course scope

- Simpler design task
- Easier and/or fewer deliverables
- Spread workload with largest practical team size
- No competition
- Compensate with gap-semester offering

Revolutionary approach: grow boundary conditions

- Offer thesis credit
- No structured course offering
- Add another milestone (e.g., design review, report)
- Smaller teams
- Competition-focused

Acknowledgements

- Instruction team members:
 - Sebastian Speck
 - Hannes Ross
- Design review attendees
- Design education community
- Students