



# Introducing engineering students to international virtual collaboration: *Lessons Learned*

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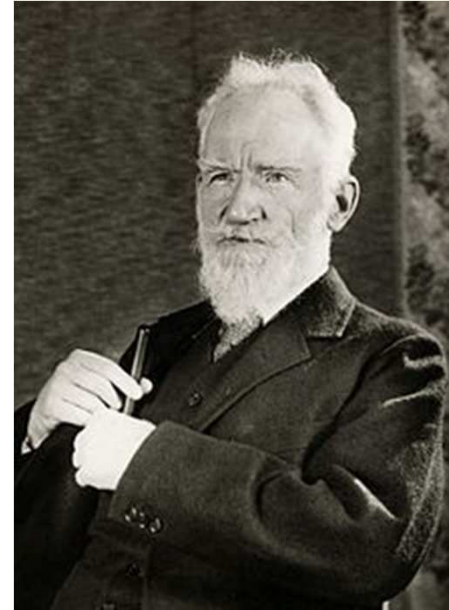


***Annual Meeting, May 23-26, 2017***

# Opening Remark

**Both optimists and pessimists  
contribute to the society.**

**The optimist invents the aeroplane,  
the pessimist the parachute.**



*George Bernard Shaw*  
1856-1950

***Greetings to the Optimists!***

# A Practical Example

Engineering students need to learn to

- apply their theoretical knowledge to problem solving
- manage and accomplish projects
- work in teams



What about

- International collaboration?
- Virtual team work ?

# Curricular Aspects

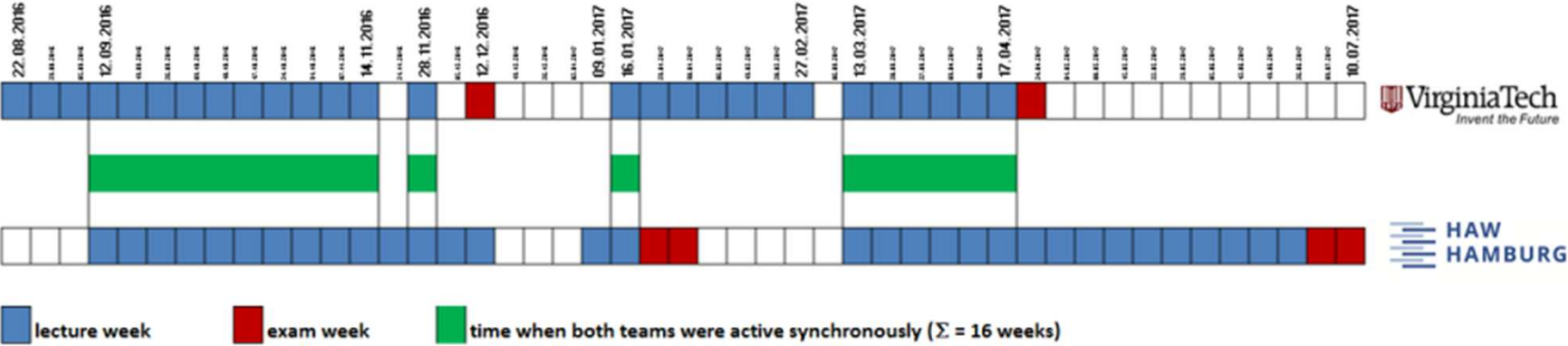
## Aeronautical Eng. Classes/Modules for our Collaboration



|                  |  |  |
|------------------|--|--|
| Year             | Final year students                              | Final year students  |
| Class            | Capstone Aircraft Design                         | Individual/Team Project  |
| Nature           | Compulsory                                       | Compulsory, but students are free to chose supervisor and task |
| Credits          | 3 + 3  | 8 ECTS   |
| Duration         | Full academic year                               | not specified  |
| Team size        | 8..10<br>Students select their teammates         | 1..*<br>Individual projects allowed                            |
| Task             | A selection of aircraft design projects on offer | Any kind of project is allowed: design/experiment/analysis     |
| Teaching Methods | Accompanying Lectures,<br>Regular Team Briefings | <b>No Lectures</b> , Irregular briefings                       |
| Grading          | Graded Presentations & Reports                   | Graded Report, optional presentation                           |

# Academic Calendars

## Academic Calendars of both Institutions



■ lecture week    
 ■ exam week    
 ■ time when both teams were active synchronously ( $\Sigma = 16$  weeks)

# HAW-VT Collaboration - Overview



| Year    | Blacksburg                                   | Hamburg   |
|---------|--|---|
| 2013/14 | Prof. Raj + 9 VT Students                    | Prof. Netzel + 4 HAW Students                       |
| 2014/15 | Prof. Raj + 16 VT Students                   | Prof. Schulze + 4 HAW Students                      |
| 2015/16 | Prof. Raj + 8 VT Students                    | Prof. Abulawi + 1 HAW Student                       |
| 2016/17 | Prof. Raj + 8 VT Students<br>+ 1 HAW Student | Prof. Abulawi + 6 HAW Students<br>+ 1 UMich Student |

# *HAW-VT Collaboration*

## *Academic Year: 2013-2014*

### **Team 1**

- Five VT students
- Four HAW students

| Team Member        | University | Responsibilities                                   |
|--------------------|------------|--|
| James Bizjak       | VT         | Structures, Materials                              |
| Ingo Goldstein     | HAW        | System Integration, Camera System, External Lights |
| Bryan Jackson      | VT         | Aerodynamics, Stability Analysis                   |
| Robert Keller      | HAW        | Systems Integration, ELS, Power Supply, Air Data   |
| Benjamin Krützberg | HAW        | Manufacturing, Flight Controls                     |
| Sean Lynch         | VT         | Propulsion, Vehicle Performance                    |
| Sebastian Mellert  | HAW        | System Integration, Fuselage                       |
| Chris van Oss      | VT         | Stability analysis, Weight, Cost                   |
| Stephen Young      | VT         | Component Implementation, Logistics                |

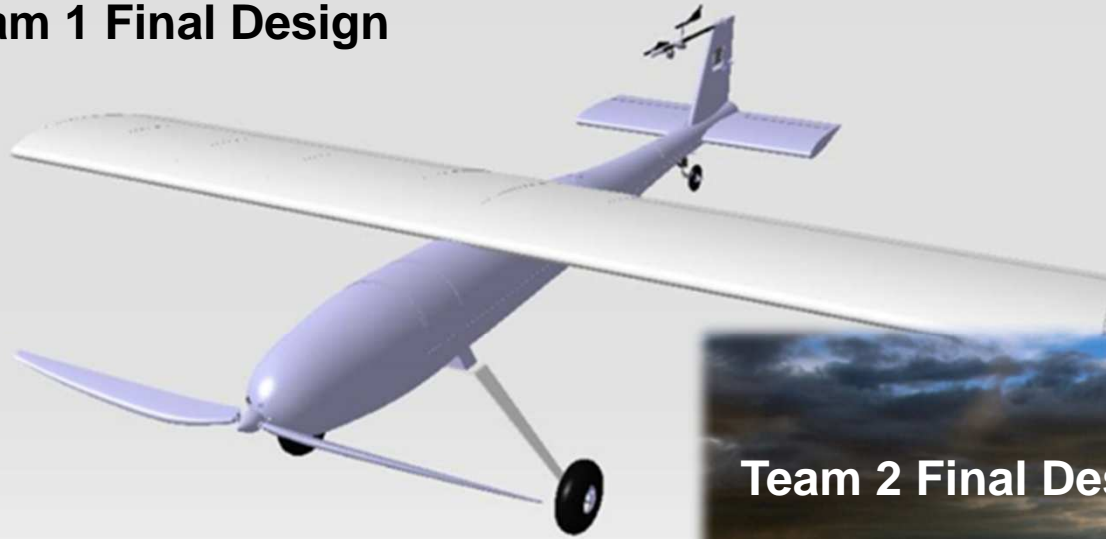
### **Team 2**

- Four VT students
- Two HAW students

| Team Member     | University | Responsibilities                 |
|-----------------|------------|----------------------------------|
| Eric Santure    | VT         | Team Lead, Structures, Materials |
| Ingo Goldstein  | HAW        | CATIA support                    |
| Andrew Dean     | VT         | Propulsion                       |
| Robert Keller   | HAW        | CATIA support                    |
| Peter Gunderson | VT         | Aerodynamics, Stability          |
| Dylan Shean     | VT         | Performance, Controls            |

## *HAW-VT Collaboration Academic Year: 2013-2014*

**Team 1 Final Design**



**Team 2 Final Design**



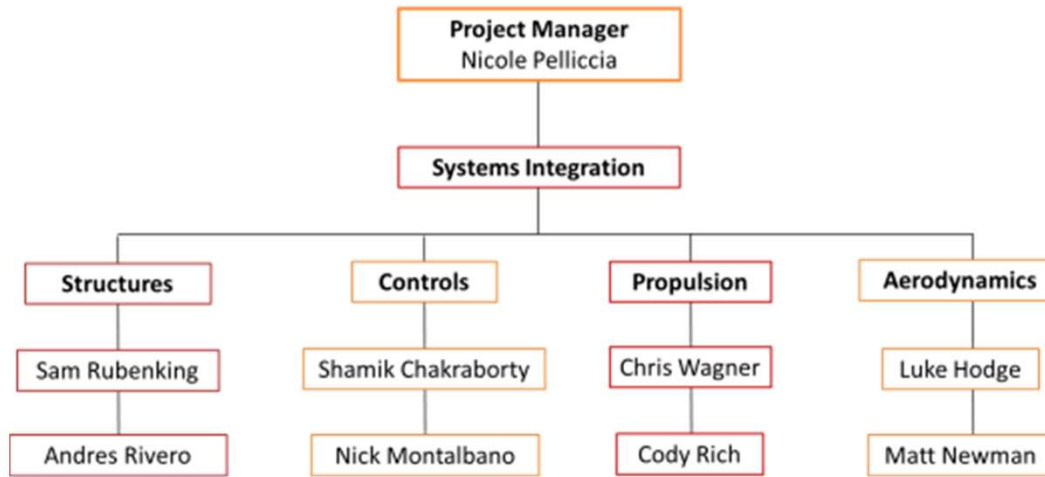
*Neither design was  
mature enough for  
manufacturing and flight  
testing*



# *HAW-VT Collaboration Academic Year: 2014-2015*

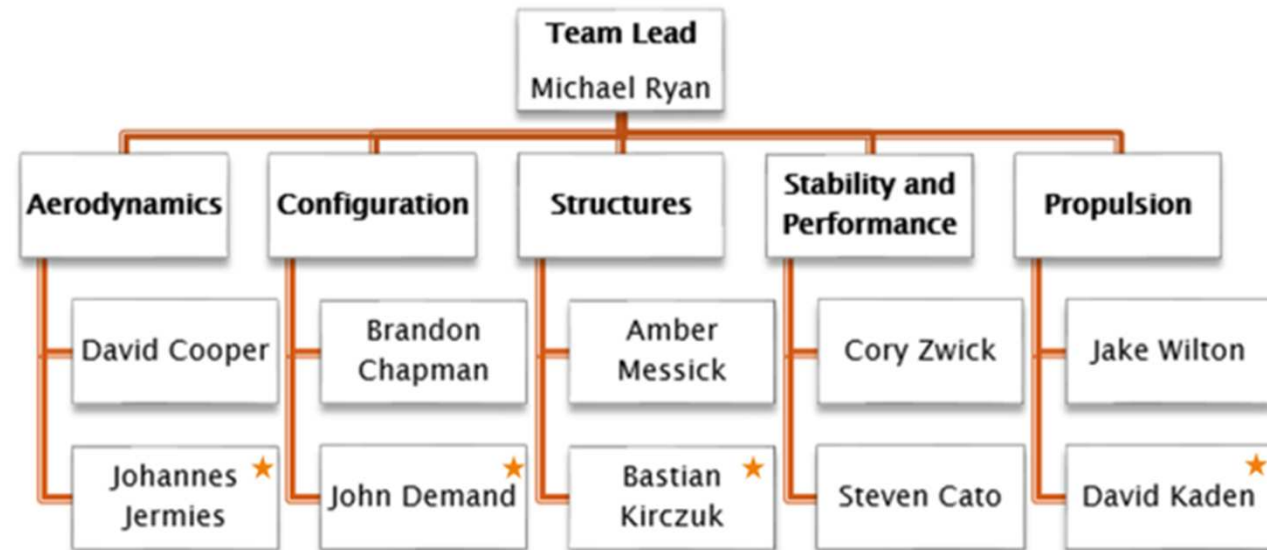
## Team 1

- Nine VT students
- Zero HAW students



## Team 2

- Seven VT students
- Four HAW students



★HAW

# *HAW-VT Collaboration Academic Year: 2014-2015*

**Team 1 Final Design**



**Team 2 Final Design**



*Change of leadership at  
HAW changed the level of  
interest and direction.*

***HAW-VT Collaboration  
Academic Year: 2016-2017***



# Lessons Learned

## Critical Enablers:

### Human Factors

- Faculty members involved & their motivation/commitment
- Students curiosity, motivation, open-mindedness & resilience

### Organisational Aspects

- Curricular alignment
- Academic calendar discrepancies

# Vital Questions before Getting Started

## Teaching Aspects

- **Are there classes/modules in both institutions with suitable and matching learning outcomes for collaboration?**
- **Do we have lecturers at home and at our partner university who are willing to cooperate & embrace the challenges?**
- **Do we have students who will volunteer or who can be forced to participate in virtual international team project?**
- **How and when will teams be formed and project work be kicked off?**
- **What kind of didactic methods / teaching support / coaching is available / required?**
- **What technical support / infrastructure is available / required?**

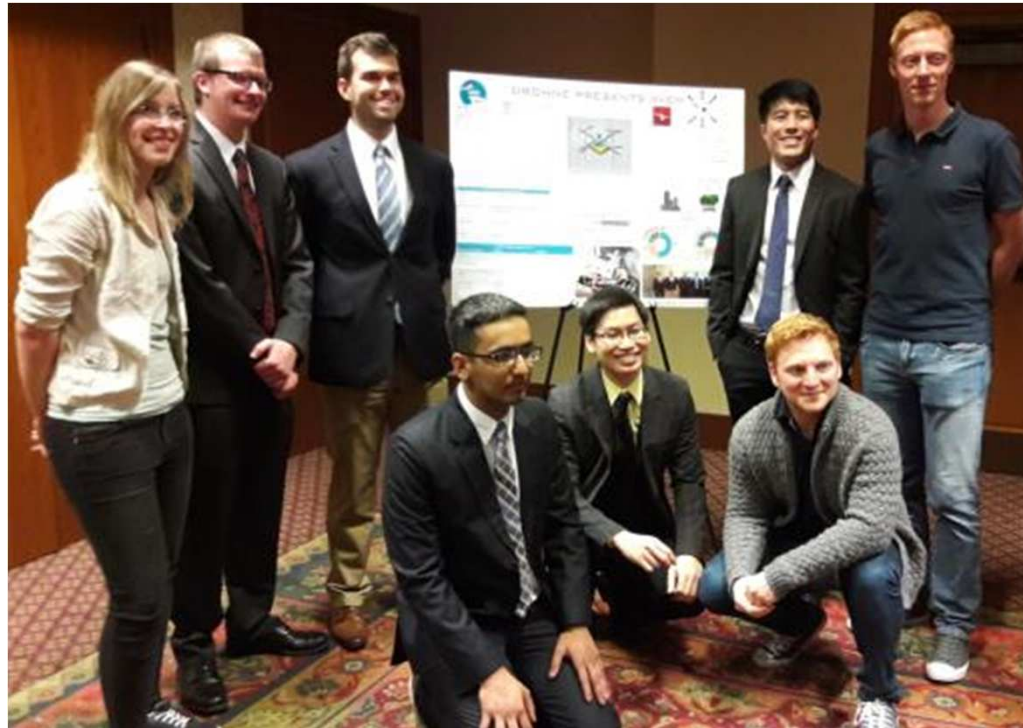
# **Vital Questions before Getting Started (2)**

## **Organisational/Strategic Aspects**

- **How big is the mismatch in academic calendars?**
- **How will language barriers, time zone differences, cultural differences be overcome?**
- **What support do both organisations offer: travel funds, incentives...?**
- **Will team members be able to meet physically?**
- **Do virtual international team projects address strategic goals of your institution?**

# Conclusion

Virtual International Collaboration is not as easy as it may seem...



... but it is a wonderful experience not to be missed!