Future Opportunities for Universities in the Aviation Industry over the next 10 years

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Seminar, Kivi ledenvergadering, Delft – November 29, 2016

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1.

Introduction

Disclaimer; this seminar is not intended to be complete. There are opportunities for research that will not be discussed such as the impact of terrorism on aviation, the impact of long haul low cost airlines, development of frontports, reducing turnaround times to 20 minutes, MRO developments, fleet planning, alliance forming, network and airport development etc.

Where are we today and where do we go from here?

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This is a current research topic …..

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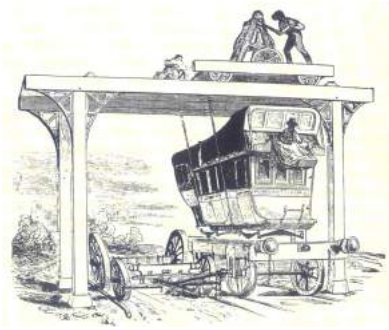
But what is next: Advances in transport technology

- Containerisation
- Hauling ore
- Aviation

Do we still have challenges?



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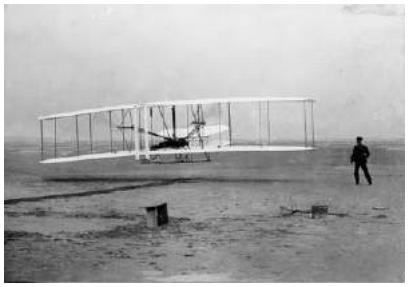

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Challenges lie in the interaction between processes, systems, equipment, people and control (management).

2.

Automation

Finding your way around airports

Info system @ SIN

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Robot Spencer assisting people to find their gate @ AMS

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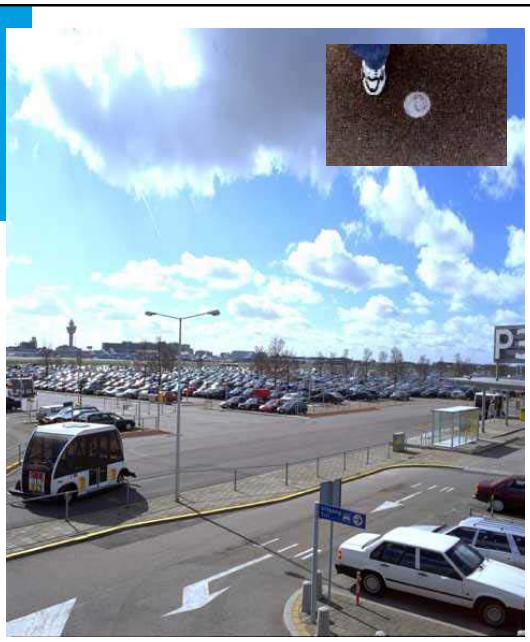
Pokémon
GO
Onix
PC 10

Seamless mobility in aviation

Utilization of automated guided equipment



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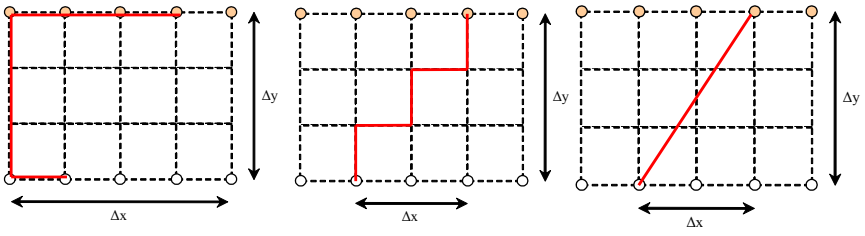
Routing algorithms based on fundamental studies into pedestrian behavior.



Loop Mesh Free ranging

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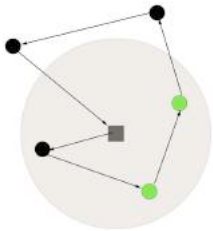
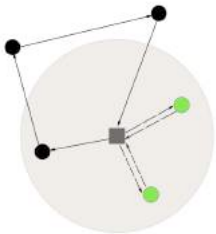
A logistic challenge

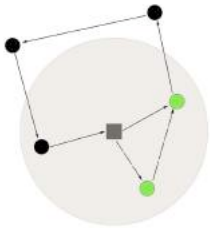
= Depot/warehouse
= UAV eligible customer
= UAV uneligible customer



Travelling salesman routing



Alternative 1



Alternative 2

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Many other issues: safety, security, environmental impact

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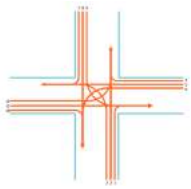
Safety is a special issue



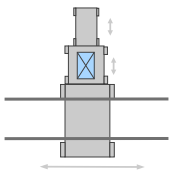
Routing (priority rules), detectability, situation awareness, sensor systems

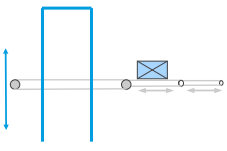
Next generation baggage loading systems for wide body aircraft

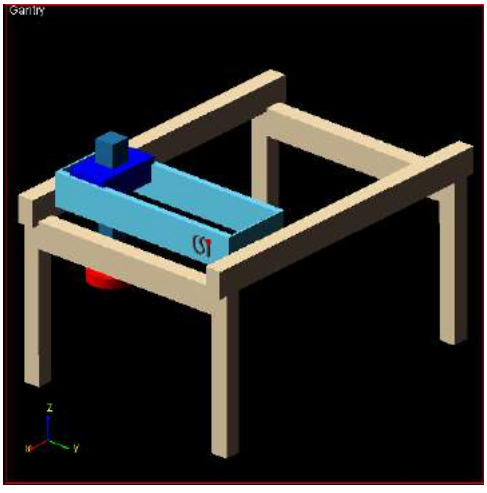
Transport in x-. y-, en z-direction to reach all spots in a ULD

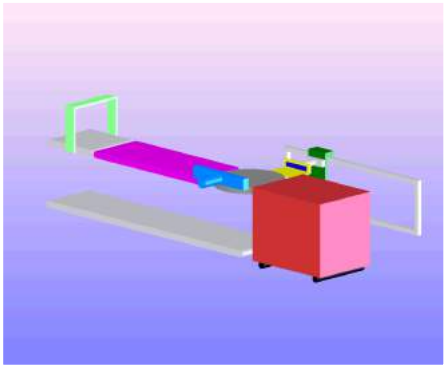
- Gantry-robot
- Scara-robot
- Spherical robot

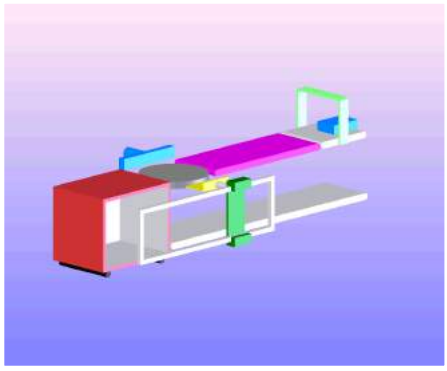
- Telescopic belt conveyor in portal



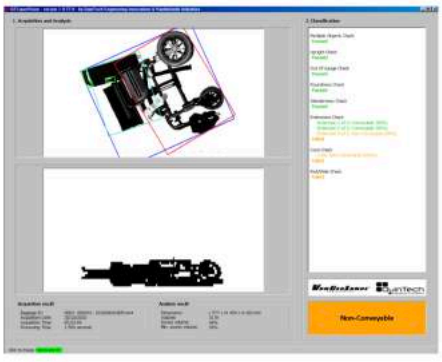



Gantry

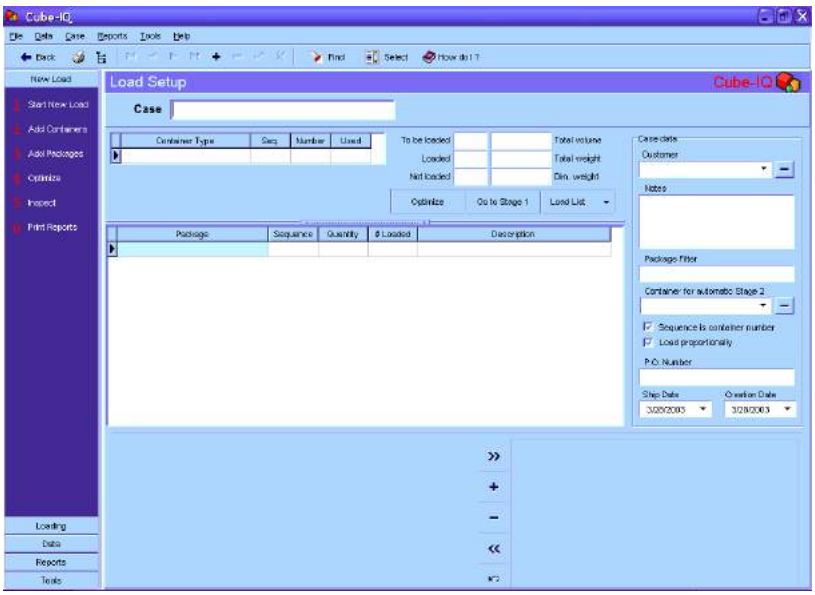




BAGCHECK™: an automated conveyability check



If you know what is coming then you can use that information



Packing is one thing, automated controlled unpacking is something different…

3.

Information & efficiency

Next generation baggage loading systems for narrow body aircraft

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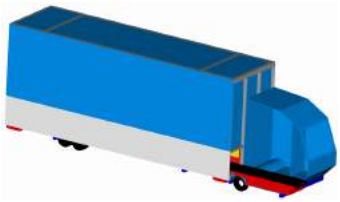
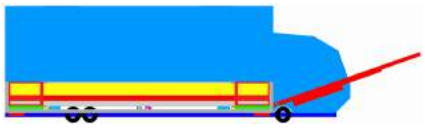
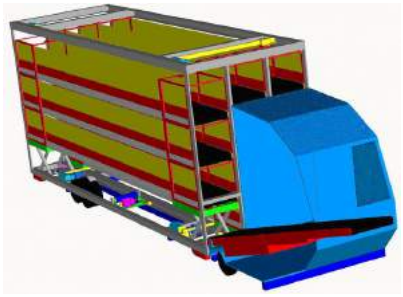
- Bagloader (+/- 1960)

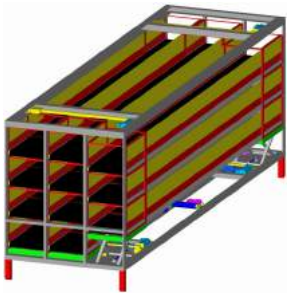
- Conveyor to the plane (Arlanda 1992)

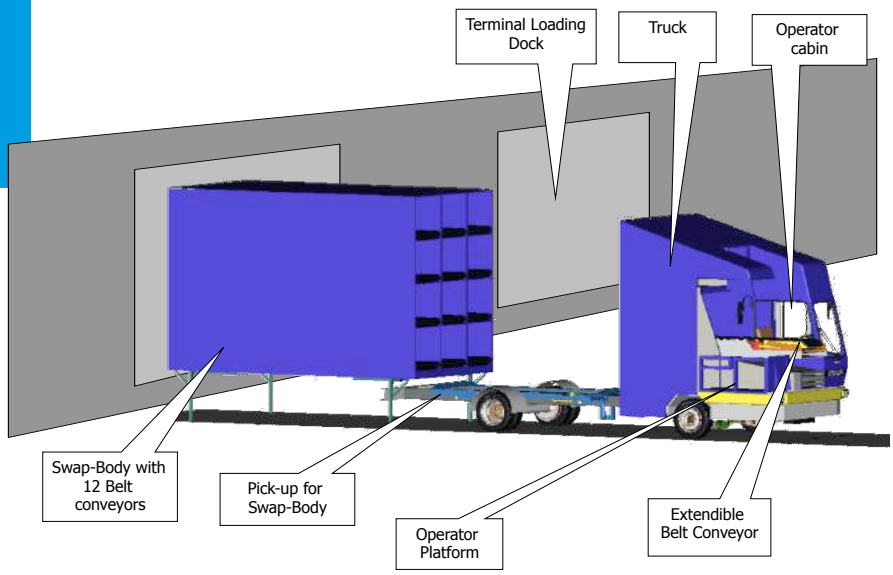
Baggage truck with storage capacity











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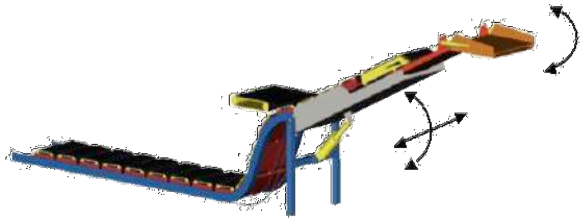
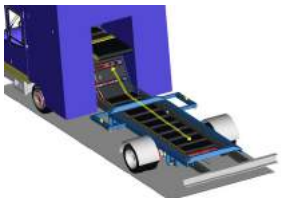
With built-in Rampsnake®





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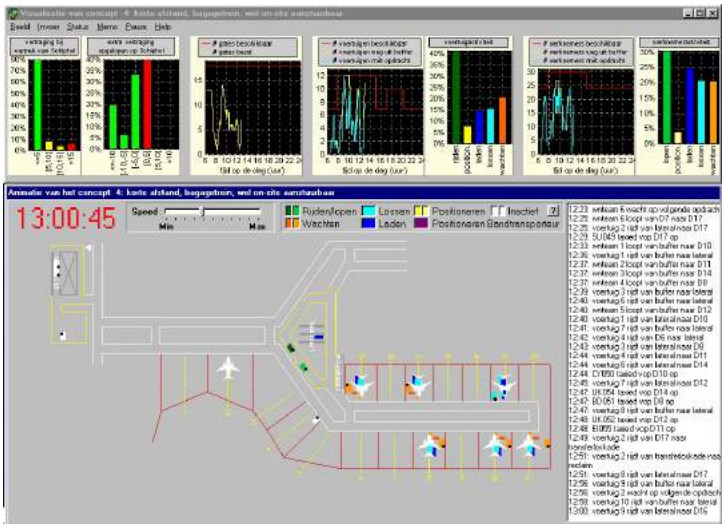
Rampsnake®

Pictures actual Rampsnake®

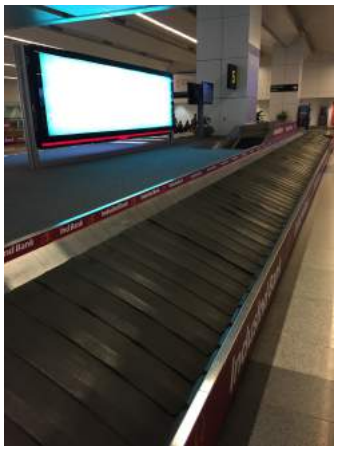
Now working at Zaventem, Belgium

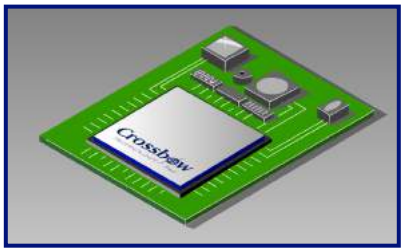
Simulation model for AAS



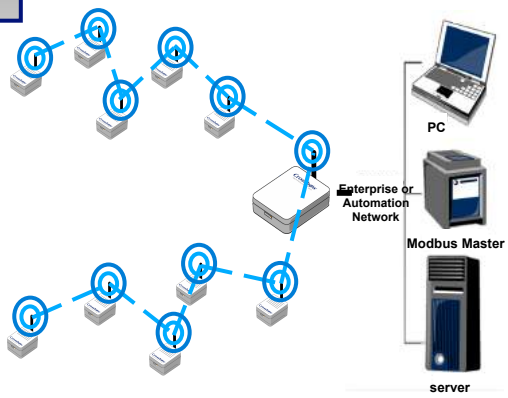
Technology is great but was is the impact on the operation on the tarmac?

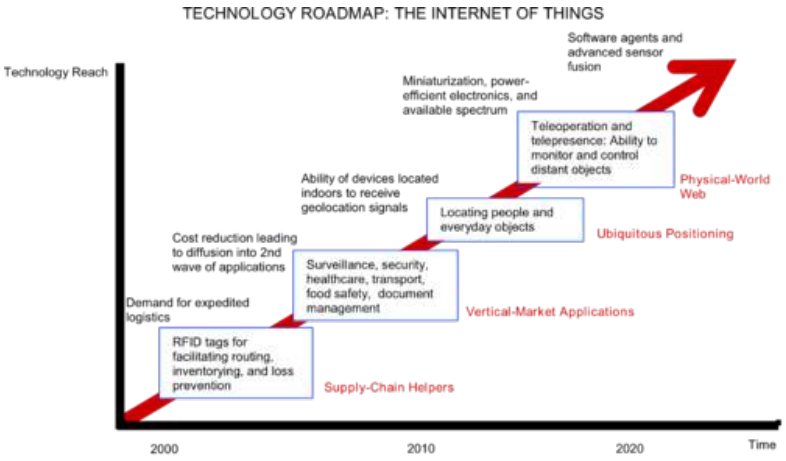
Tracking and tracing – information on the go





RFID and sensor networks





IOT and the application of big data

Passengers

Equipment, components etc.

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Big data and service enhancement

Cater to need not to standard

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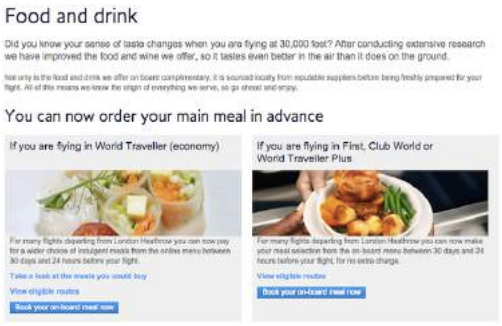
Personalized catering (services)

Book the cook (SQ)



Pre-order meal (BA)

Why not be proactive and use:

4.

Safety & security

Security of passengers and staff

System, procedure, legal issues

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Carry on baggage; system, procedure, reverse logistics

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This is not what we want

Security of tax free items, freight (supply chain) etc.

Safety in aviation: fundamental studies

Impact of pilot decisions on operational result.

5.

Environmental impact

Energy saving options in baggage handling

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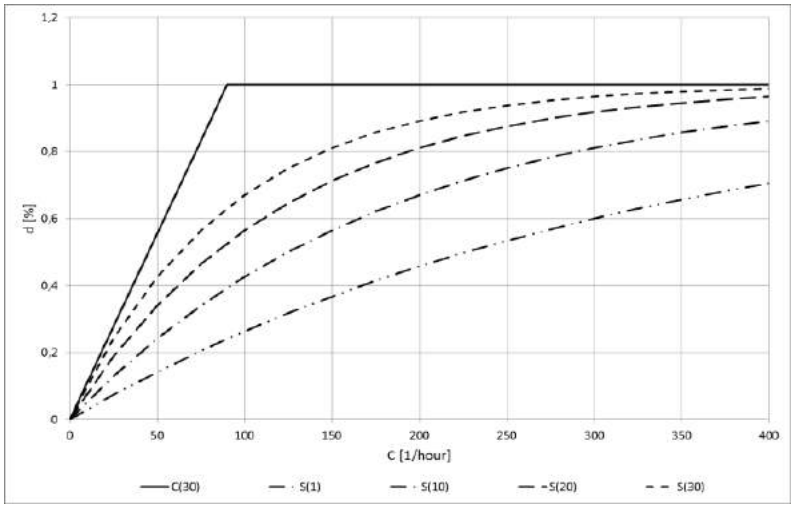

Duty cycles of a belt conveyor as a function of the conveyor's capacity for baggage with constant (C) and stochastic (S) interarrival times.

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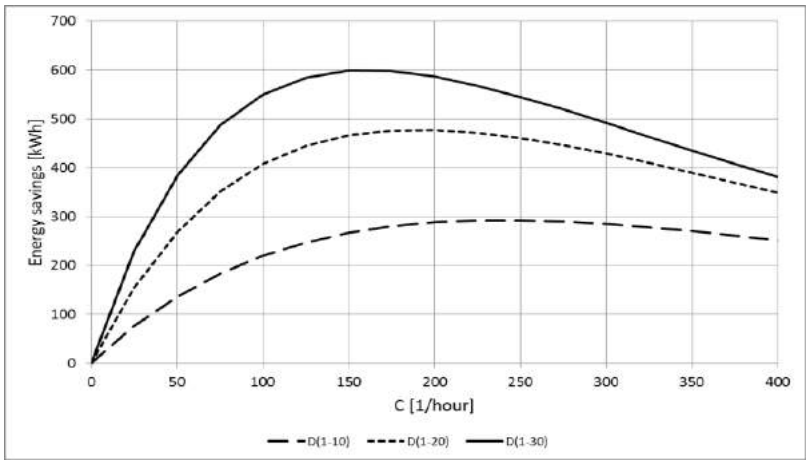
Results: possible energy savings @ RTM



Possible energy savings obtained when reducing the delay time

Energy saving through continuous descent approach & alternatives

- Landing order negotiations
- dynamic gate allocation
- taxiing options

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Energy saving options in people movers

- Individual versus mass transport
- Continue versus discontinue transport

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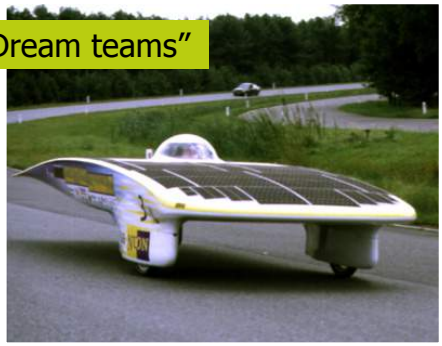
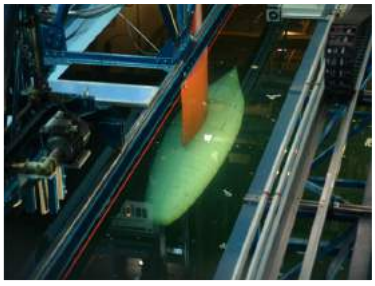
Capacity planning based on requested capacity

6.

Students & living labs

TU Delft "Dream teams"





UNSW "Dream teams"

Anything aviation related?

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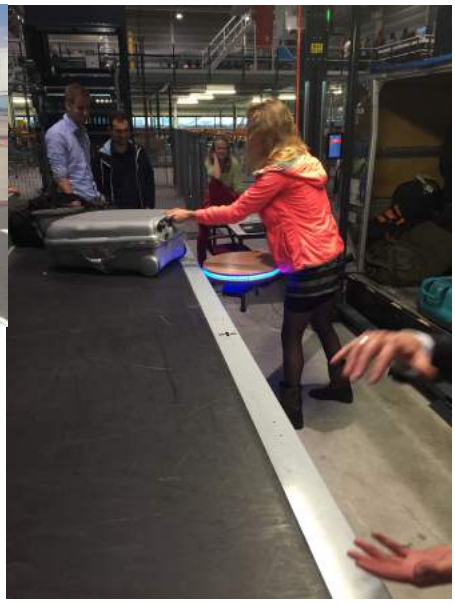

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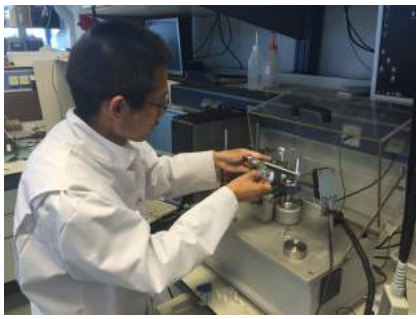
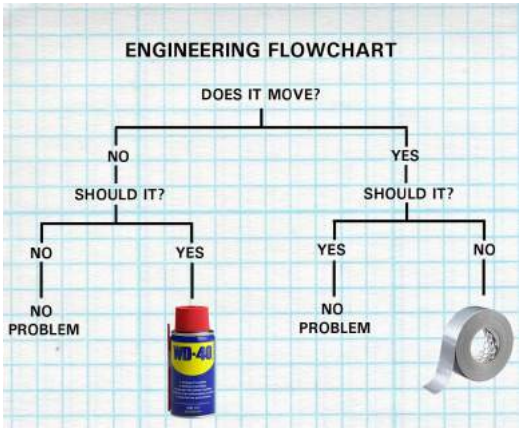


Living lab

Science

Some results

To conclude:



The engineering approach, also in aviation.

Thank you for your attention. Are there any questions?