UNSW Aviation Society

# AVIATION INTERNATIONAL STUDY ABROAD PROGRAM REPORT

Netherlands 2019


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# Contents



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# Delft University of Technology


**Students celebrating the joys of Aviation at TU Delf (Image: AvSoc)**

Founded in 1842, Delft University of Technology (TU Delft) is Netherland's largest and oldest public technological university. It is ranked in the top 20 worldwide for Engineering and Technology and has one of the most competitive Aerospace Engineering courses in the world.

Our visit was hosted by TU Delft's VSV Leonardo da Vinci, a student society dedicated to Aerospace. Starting with a full tour around TU Delft's Faculty of Aerospace Engineering, we saw the SIMONA Research Simulator; a multifunctional machine that can realistically simulate all types of aircraft, including the Airbus 320 and Boeing 777, helicopters and even cars. Built in collaboration with KLM and many other industry experts, the SIMONA Research Simulator's fly-by-wire system can switch between various flying modes from military training to commercial flying, providing valuable data for researchers and students alike. Next we were invited to tour their hangar, which contained machinery and aircraft parts but also works-stations and closed off areas for testing projects. One area is the Drone Motion Testing Field, where students can test their drones safely within nets. A satellite is used for system tests of spacecraft and can track the movement of drones and research on drone flying stability. This technology is used for self-designed drones with the purpose of future military use.

Another interesting area is the hangar, which is partially owned by NLR and houses real, unused aircrafts and aircraft parts. These are displayed for students to understand the details and complexity of various systems, aiding their education in the field of aerospace engineering.

One of the rarer display pieces was the General Electric CF6 Turbofan, which formerly powered a KLM B-747. This engine is After the tour, we were invited to experience one of their fundamental Lectures—Introduction to Aerospace Engineering presented by Prof.dr.ir Jacco M. Hoekstra. The lecture discussed the pioneers of aviation and the history of aircraft as well as various theorems and equations regarding aircraft aerodynamics. We learned about Bernoulli's Principle, basic airfoil aerodynamics, the

philosophy of aircraft designs and equations for lift and drag. Afterwards, as part of their tradition, all students gathered outdoors to witness the implosion of a metal cylinder filled with hot water and water vapour.

Despite the similar study mode lectures, workshops and tutorials) and assessments (group work, individual projects and final exams), students studying Aerospace Engineering at Tu Delft are much more independent engage intensively with their course. This can be seen by the depth of their introductory lecture and the high caliber of questions asked.The course progression at TU Delft is steep yet rewarding as it provides students with plenty of freedom as they can pursue many topics of their choice. Both the student society and university offer assistance such as internships to widen students perspectives in their field of expertise.

We observed students building their own plane —as part of their coursework. Students were tasked to build their own functioning aircraft, of which 50% of the knowledge required external research. Project management skills and engineering skills were tested, mimicking a real-life project. Students required up to 8-16 dynamic research hours per week for permission to work in the lab.

Another very intriguing aspect of our tour was the Atmospheer student lounge and bar, specifically for the VSV student society. They offered 1 Euro beer and hosted many events such as welcome drinks which we were invited to. In the cozy atmosphere we discussed cultural differences between our respective universities and learnt about their course structure specifically the projects and work they have to complete throughout the years.

**GE CF-6 Turbofan (Image: Nishant Kana Jayaram)**

**TU Delft aircraft at the University Hanagar (Image: Salomy Li)**

# dnata Cargo


**Students with dnata staff at dnata Amsterdam (Image: AvSoc)**

Our visit to dnata Cargo was a fascinating insight into the complex world of air cargo. We commenced the day by listening to a presentation in the boardroom by Gerard Kervezee the CCO of dnata Netherlands. He provided a detailed look at dnata as a company, as well as an overview of how cargo logistics work on a global scale.

In 2015, dnata reached an agreement with Belgian company Aviapartner to acquire its cargo handling operations at Schiphol Airport in Amsterdam. Included in the acquisition agreement was the Schiphol Animal Centre, the Temperature Control Centre and the airside/freighter ramp handling activity. Currently, dnata is providing cargo and ground handling services to 25 cargo and 8 passenger airlines at Schiphol.

dnata NL handles 50-52 full freighter aircraft per week, which has fallen from the figure of 67 per week last year, due to increasing slot restrictions at Schiphol Airport. In conjunction with this, dnata are facing challenges as the airport continues to develop. An extension of the passenger terminal building will force cargo companies (including dnata and KLM) to relocate their handling and sorting facilities to a new location further away from the apron. The ground time (particularly for transfer cargo) will increase, pushing up labour and other operational costs.

Following Gerard's presentation, we embarked on a floor tour of the cargo operations facilities. We first visited the Animal Centre, a specialised section dedicated to catering for animals - particularly horses. The space is well air conditioned and is staffed by a full time vet to ensure animals are well looked after in transit. A separate sea-life room contains special red overhead lighting so as not to stimulate live fish being transported. It was incredible to see the amount of effort that goes into ensuring live animals are transported with as minimal disruption to their natural cycles as possible.

Cargo facilities such as this are broken up into two main regions: exports; and imports. In the exports side, cargo arrives from external shippers, generally on wooden pallets. From here, staff must break down the pallet and then restructure all the items onto an aviation

suitable unit load device (ULD). Generally, this is in the form of a large metal sheet called a PMC or PAG. It is important to ensure that the unit is built to the correct size, so it can safely fit into the aircraft. Presently, most ULDs are built up and judged for size based on intuition, or using tape measures. Whilst this may be quick, it can lead to numerous issues during loading and potentially damage or delay aircraft. dnata have invested in a new 3D scanning system which will enable staff to accurately measure the dimensions of any ULD. This will ensure things do not go out of their size limits, and minimise delays. After securing and wrapping this consignment, it is labelled, security checked and taken out on a dolly to whichever aircraft it is destined for.

Imports, meanwhile, operate in the reverse. The aviation ULDs are brought in from the aircraft and enter the breakdown area. Here, cargo staff open the straps and packaging and remove all the cargo from the ULD, placing them on whatever the customer has paid for (e.g. wooden pallet, shipment box etc.). After clearing through a customs check, the cargo is then handed over to the freight forwarder who takes responsibility of it from there. With any cargo transport, temperature control is of paramount importance. dnata have several sealed rooms that are used to store perishable items such as pharmaceuticals, food and flowers. Each room is set to remain within a specific temperature range, and can be as low as -21C for highly sensitive cargo. Interestingly, although this particular room has never been used, dnata are required to have it available to maintain its IATA accreditation.

Following the tour, we headed back to the boardroom for lunch, before wrapping up our visit. Perhaps the biggest take away from this visit was discovering the immense scale of air cargo operations. This is a part of the industry that most people hardly see, or hear about, yet it is such a critical part of the global economy. Air cargo makes the world run at the fast pace that it does, and is truly a fascinating part of the industry.

**dnata Cargo handling at Amsterdam Schipol (Image: Salomy Li)**

# KLM Cargo


**Students with KLM staff at KLM Cargo (Image: AvSoc)**

Established in 1919, KLM is named the world's oldest airline operating under its original name. With a fleet of 214 aircrafts, the KLM Group offers both passenger and cargo services to 92 European cities and 70 intercontinental destinations. Alongside KLM, the KLM Group also includes two subsidiaries; The low-cost carrier Transavia and the Dutch cargo airline Martinair.

In 2004, through mutual agreement KLM and Air France merged into becoming Air France–KLM; 1 group, 2 airlines. From this, AIR FRANCE KLM MARTINAIR Cargo has become a key player in the air cargo industry with 1.2 million tons of cargo flown generating €2.3 billion in combined revenue.

During our visit to KLM's cargo facilities in Amsterdam, we were able to take a tour around the cargo warehouses and learn about how the KLM Group handles their freight operations.

The Key Highlight of our visit to KLM's Schiphol hub was a sneak-peak of their newest development – a state-of-the-art parcel/ cargo sorting system that aims to serve the growing e-commerce and bulk packages segment, housed inside original warehouse (vrachtstation 1). The innovative design retains the 20th-century modern architecture whilst eliminating the heavy lifting by workers, forklifts and queues, allowing AF-KLM to offer a time-critical e-commerce logistics product. The elimination of dwell time for packages enable AF-KLM to better monetise the value of belly space on continental narrow-bodied flights, which is less time-consuming than trucking and have less carbon footprint than short-haul cargo flights.

KLM is currently one of the last operators for major Combi aircraft in the world, operating several 747-400M aircraft that carry both passengers and cargo on the main deck of the aircraft. It allows for a cheaper "fixed" cost per ATK compared to full freighters when demand cannot justify a cargo service. However, with more capable wide body aircraft entering the market, such as AF-KLM's B777-300ER (dubbed the mini freighter); more pallets could be combined with bags in the lower deck of these long range jets, replacing the need to re-engineer

the configuration of the aircraft.

We are also impressed with the versatility of AF-KLM's cargo network from a French 77F, KLM branded 747 freighters, belly cargo and trucks; where different needs could be satisfied with enormous flexibility to fill the demand gaps with charters and dual-hub worldwide network (CDG and AMS).

Most of us have learned more about the economics of air cargo with the kind staff putting up a talk introducing the role of freight forwarders , the airline and the consumer in the air cargo value chain. A simple freight shipment between Los Angeles and Hong Kong via Amsterdam was used to illustrate the different nature of air cargo connectivity compared to the passenger side. In the mean time, the new e-commerce and e-shipments on the state of the art EAWB (Electronic Air Waybill) implementation were also showcased throughout our visit with a sight of emerging technologies such as Internet of Things and RFID.

This visit overall was an eye opening insight into the work of KLM and air cargo. We can't thank the KLM team enough for volunteering their time to give us this experience.


**Students at KLM Cargo distribution centre (Image: Salomy Li)**


**Presentation of the 747F (Image: Salomy Li)**

**Students posing behind a cross section KLM Cargo 747F (Image: Salomy Li)**

# Netherlands Airports Consultants


**Students at NACO after their presentation (Image: AvSoc)**

Netherlands Airport Consultants (NACO) founded in 1949 in the Hague is part of the Royal HaskoningDHV. Known as a "one stop development", NACO is both an airport consultancy and a global engineering firm, specialising in airport design. NACO works closely with the development and planning of airports providing expert advice and engineering assistance. With multiple branches around the world such as South Africa, Taiwan, Mexico and United Arab Emirates, NACO has provided services 600 airports in more than 100 countries, regarding airport planning and design.

Boasting over 65 years of expertise in airport design and consultancy, some notable projects supported by NACO include Beijing Capital Airport, Amsterdam Schiphol Airport and Bangkok Suvarnabhumi Airport. NACO is a vital company within the dynamic aviation industry, enabling growth and long-term developments to guide the future of airports.

The morning session started with a presentation summarising the economic climate of the aviation industry. We focused on three areas that affect airline profitability: revenue, expenses and EBITDA. This was then analysed in the airport context and we documented the changes in the airport management model throughout the years.

Looking into the future, multi-scenario analysis is becoming an increasingly important tool for simplifying the decision making process. Through simulating the airport at various capacity thresholds, management can generate high level traffic forecasts that can expose any weaknesses or limitations that may affect passenger experience and airport operations. This analysis could be refined to provide valuable information on the facility sizing model and optimisation of airport expansion.

Our second presentation was an example case that NACO had worked on; a brownfield airport in Thailand that required facility upgrades, development potential and a sustainable outlook. outlook. We analysed the details of the Masterplan through 5 steps: analysis of the present, looking beyond the horizon, considering the variables with land use plans and determining plans and alternatives. Following this, functions such as

runway length, capacity, sizing and orientation based on wind condition had to be taken into consideration, with the end goal of developing airside infrastructure, support facilities and maximising land mass to respond to passenger demand.

Lastly, we presented our findings on Australian Airports to NACO, listing and analysing the Australian market condition, aviation challenges and developments and presenting innovative solutions that would be feasible to implement.

Both airlines and stakeholders have increased expectations on airport functions with deregulation of the aviation industry providing more freedom for innovation. The increased pressure on airport operators have resulted in higher demand for creative and sustainable airport designs. However, with external factors (politics, technology and competition) affecting airport bargaining power, cost becomes a major factor affecting profitability. Airport designers have to continuously innovate with structures that that not only withstands weather demands but is built with flexibility and can react to changes in capacity.

The emphasis on change within the air transport industry has been highlighted through the fast development in airport operation models, passenger traffic and stress on airport infrastructure. While airports have traditionally been led by governments with a sole focus to transport people between cities, it now must also be sustainable and generate return on equity. We learnt various solutions to inherent problems such as preventing runways from flooding by creating dams to drain water away and also installing solar rays to conserve energy.

There were many experts in multiple areas of airport planning that spoke to us about new developments. From interns to graduates to senior consultants, we were provided a well-rounded understanding of the different aspects of the aviation industry, helping us broaden our knowledge and appreciation airport planning and design. Having the privilege to engage with such professionals was an eye-opening experience for all the students.

In addition, it was unknown to many of us that NACO had support and provided services to over 600 airports around the world, varying from large, international hubs to smaller regional airports globally.

**Students providing a  presentation on the Australian Aviation  Market (Image: Salomy Li)**

# Netherlands Aerospace Centre


**Students in front of the NLR Office (Image: AvSoc)**

Netherlands Aerospace Centre (NLR) is Netherland's national aerospace research centre and a global leader in the aerospace industry servicing over 30 countries. Founded in 1919, its mission involves improvement of air transport safety, sustainability and efficiency. NLR's activities span the spectrum of scientific research, development and technology organised around five sectors: civil aviation, defence and security, civil aerospace, space and safety.

NLR is dedicated to innovation and strives to increase the safety of aviation with more sustainable and efficient solutions engaging in all phases of aircraft and aircraft component development; from research to testing to qualification and certification.

NLR has just celebrated its 100 th year of operation and was awarded the 'Royal' designation in its name; a testament to the resilience, and contribution NLR has made to aerospace and aviation industry.

We were hosted by Juan upon arrival and and given a presentation about NLR's missions, main operation principles and major projects, both past and present. This provided students a broad understanding of the services provided by NLR and the challenges involved. A great example is NLR's development of 'Skyboard' which supports Airport-Collaborative Decision Making (A-CDM) training programs that increase efficiency through stimulating collaboration between stakeholders. Thus, this game-like program powers sustainability by reducing airport impacts on the environment and society.

Following the presentation, we were provided a tour through the building to the Virtual Community Noise Simulator and Air Traffic Control Simulator room. The Virtual Community Noise Simulator simulates real scenarios of potential noise impact generates from aircrafts in real locations through virtual reality. Students were provided opportunities to explore various scenarios and experience the impacts of aircraft noise and have a better understanding of the impact of noise on the environment.

The Air Traffic Control Simulator room was a

state-of-the-art facility with complete functions that mimicked a real air traffic control tower. It provided a 360-degree digital view of Schiphol Airport and is used for training but also testing and optimisation of new software and procedures.

One of NLR's missions is reducing noise disturbance. This global challenge affects all airports worldwide and has an especially strong presence in Amsterdam as it is the second largest hub in Europe and nearing capacity. Continuous growth and expansion of the airport has caused strong social –and concern among residents.

Following our presentation and tour, all students participated in a Kahoot quiz to test their knowledge of both NLR and Aviation. The questions span from general aviation knowledge to NLR disciplinary questions, allowing students to review facts and figures learnt throughout the visit. The prize was NLR merchandise, won by the Vice President of UNSW Aviation Society.

# Vanderlande


**Students infront of the Vanderlande sign (Image: AvSoc)**

Vanderlande is the global market leader in providing innovative automation solutions and active in four main sectors in the industry: airports, warehousing, parcels and life cycle services. With seven decades of experience in logistic process automation and continuously growing business, Vanderlande is a reliable and highly sought after around the world by various businesses.

The morning session began with a concise presentation held by our Host Mr Peter Hoefkens from Business Development and Innovation. An introduction of the company was presented, and we were exposed to problems and solutions that Vanderlande faces beyond the aviation scale. In addition, we were given an introduction to basic design and future development of baggage handling systems in airports worldwide. It was awe-inspiring to see just how much planning and thought goes into something that most travellers wouldn't think twice about. Whilst baggage handling is the core of Vanderlande's airport operations, they are also involved in things such as automated security screening systems and passenger check-in functions.

Afterwards, we toured the Innovation Centre; a large space which tests newly developed designs and offers demonstrations to clients. We also saw the Manufacturing Warehouse and saw many technological innovations on display. We witnessed the testing of AGV (Automated Guided Vehicle) systems: the future of airport baggage handling and saw how its design could be used to adapt and serve other industries such as parcel and warehousing.

Beyond aviation, the company is focused on streamlining the warehousing and distribution process. In the innovation centre, we observed a completely automated system that was used to break down and build up pallets of stock, either for retail storage or air freight. Such systems are still under development, but when they are completed, they have the potential to significantly reduce costs in a number of industries.

After the tour and a short break, AISAP participants were challenged to design and remodel the existing baggage handling system at Cristóbal Colón Airport by introducing an AGV system. Participants were

divided into four groups and given an hour to integrate the knowledge from the morning session into a consolidated, functional and economical design. Each group presented their plan, reasoning and provided calculations to back up their implementation strategy. The CEO of the airport provided us with feedback and the winner of the project was Group 3 due to their seamless integration of the hybrid characteristics of the AGVs with the existing infrastructures.

Vanderlande's baggage handling systems are active in over 600 airports worldwide moving 4.2 billion pieces of luggage per year. Taking a proactive approach to identifying pain points within the airport environment, Vanderlande has invested heavily in more flexible and efficient systems for baggage handling such as AGV systems.

The interactive session gave students an in-depth perspective of the factors that need to be considered when implementing new projects. While we gained insight into the engineering scope of the aviation industry, we also saw the importance of balancing management and technical expectations.

It was interesting to see how baggage handling system design is shifting from the conventional conveyor system to a completely different world of AGVs. These independent vehicles are able to make highly efficient use of the airport floor-space, which is already at a premium. Unlike traditional systems, their movements and layouts can instantly be modified to adapt to the dynamic environment. The AGV systems are a major focus of Vanderlande's operations, and their uses are being explored on multiple levels. We even witnessed a fully automated lawn mower that roamed the Vanderlande campus to keep the grass in check!

We would like to thank Mr Peter Hoefkens for kindly hosting us and providing us knowledge of Vanderlande's core values, logistic solutions and providing us a preview on the future of airport baggage handling.

**Mr Hoefkens demonstrating new technology in baggage handling (Image: Anastasia Kristabella)**

**AGV system undergoing testing at the Innovation Centre (Image: Chris Kuan)**


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