AIRPORT TECHNOLOGY LAB

DIGITAL AIRPORTS AS A SOLUTION

JUNE 8 - 9

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bagchain

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Innovation Quarter

Rotterdam The Hague Airport

RHIA

Sky ECHO
HD weather experts

provincie Zuid-Holland

TU Delft

adecs airinfra

WorldStartup

Gemeente Rotterdam

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WELCOME ABOARD

Welcome to the portfolio brochure of the Airport Technology Lab, a consortium of partners led by the Rotterdam The Hague Innovation Airport Foundation (RHIA) and partly financed by the European Regional Development Fund (ERDF)/Kansen voor West II.

It is with great pleasure that we present this compilation, acknowledging the invaluable contributions of our esteemed Airport Technology Lab partners and the RHIA Community, and sharing the results of our collaborative projects. With this, and all other projects, we foster the transition towards more sustainable, silent and smart aviation.

In the fast-paced world of aviation, the RHIA Foundation recognized the need for an innovative hub that brings together cutting-edge digital technologies and industry expertise to realize a more future proof and sustainable airport. Thus, the Airport Technology Lab was established as a platform for research, data sharing, creation of fieldlab infrastructure and implementation of innovative solutions that enhance airport operations and improve the passenger experience.

None of this would have been possible without the unwavering support and dedication of our consortium partners. Their visionary outlook and commitment to excellence have propelled us towards new heights of success. We extend our heartfelt gratitude to each partner, whose expertise, resources, and collaborative spirit have been instrumental in the realization of our goals.

Within these pages, you will find a showcase of the innovative projects undertaken by the Airport Technology Lab. From local weather prediction, new applications in biometrics and security systems to optimizing baggage handling and implementing smart infrastructure. Each endeavor represents a significant leap forward for the digitization of processes and contributes to solving the challenge of capacity and wellbeing of human capital.

Moreover, this portfolio brochure serves as a testament to our commitment to transparency and knowledge sharing. By disseminating the outcomes of our projects, we hope to inspire further innovation, encourage cross-industry collaborations, and foster an environment of continuous improvement.

Looking ahead, we are excited about the future of the Airport Technology Lab. As we move forward, our focus remains on forging new partnerships, exploring emerging technologies, and addressing the evolving challenges and opportunities faced by the aviation industry.

We are looking forward to engaging with new partners to shape the further development of the Airport Technology Lab. Together, we will push the boundaries of what is needed to make aviation more smart, silent and sustainable. Don't hesitate to reach out to us to further explore shared opportunities.

Once again, we extend our gratitude to our partners and community for their unwavering support, and we invite you to delve into this portfolio brochure to witness the power of collaboration and innovation.

Welcome to the world of the Airport Technology Lab!

Miranda Janse

Director
RHIA Foundation

Mathijs Koper

Program Manager
Airport Technology Lab

ABOUT AIRPORT TECHNOLOGY LAB

As you explore in this brochure, you will witness a showcase of our projects and pilots that have been executed in the past years. From establishing a true open-data platform, groundbreaking advancements in biometrics to the implementation of smart infrastructure and digital solutions, each project represents our unwavering commitment to revolutionizing airport operations.

In addition to the projects themselves, we provide you with some personal interviews with our partners. Gain invaluable insights as they share their experiences, perspectives, and expertise. Learn about the collaborative efforts that have driven our success and how our partners contribute to shaping the future of airport technology.

Additionally, we have included company profiles of the participating organizations that form our Airport Technology Lab consortium. These profiles offer a glimpse into the innovative minds behind the Airport Technology Lab, highlighting their areas of expertise, achievements and shared vision for the future.

At the Airport Technology Lab, we believe in the power of collaboration and knowledge sharing. By bringing together industry experts, cutting-edge technology providers, and forward-thinking organizations, we foster an ecosystem of innovation and progress. Through this brochure, we aim to inspire, inform, and ignite the passion for transformative change within the aviation community.

Whether you are an airport or aviation professional seeking groundbreaking solutions or an outside changemaker looking for partnership opportunities, or an industry enthusiast eager to stay at the forefront of innovation, we invite you to immerse yourself in the world of the Airport Technology Lab.

SHOW CASES

The Rotterdam The Hague Innovation Airport (RHIA) program is a collaboration between Rotterdam The Hague Airport (RTHA) and the municipality of Rotterdam, aimed at driving innovation in the aviation sector with a sustainable impact on airport surroundings. The program, facilitated by the RHIA Foundation, includes the establishment of the Airport Technology Lab.

The Airport Technology Lab serves as a unique research, development, and training environment where stakeholders in the aviation industry work together to innovate airport processes and management. Its primary goal is to accelerate the development and deployment of cutting-edge technologies and services for airports worldwide, including regional ones. The innovations produced within the lab will play a crucial role in achieving sustainability targets within the airport domain.

By focusing on making airport processes smarter and more efficient, the Airport Technology Lab offers opportunities to enhance the sustainability of the aviation industry. This includes reducing fuel consumption during ground operations, minimizing fuel usage during flights near the airport, and optimizing energy consumption for ground handling operations. The Airport Technology Lab's initiatives contribute to lower emissions, resulting in reduced environmental impact and noise pollution. By decreasing the effects of combustion gases, the program improves the health and well-being of local communities in the vicinity of the airport.

Moreover, the Airport Technology Lab's emphasis on improving flight planning leads to reduced fuel consumption and CO2 emissions during flights. Optimized routes and direct flights between airports can result in a significant reduction in flight duration, contributing to overall environmental sustainability.

The collaborative efforts of the RHIA program and the Airport Technology Lab hold great promise for advancing the aviation industry towards a more sustainable and efficient future.

PROJECTS AND PARTNERSHIP

We focus on the following themes:
- Sustainability (Sustainable Aviation, Travel and Mobility)
- Digitalisation (Global Testbed and Data Space for Sustainable, Safe and Seamless Travel)
- Co-creation-innovation (International Collaboration with EU Data Spaces/Hubs for Tourism, Mobility, Smart Cities and Green Deal)

WP 1.1 Open Airport Platform
Lead: ADECS AirSystems B.V. | Participant: RTHA B.V

WP 1.2 Airside 4D-weather Mapping
Lead: Delft University of Technology | Participant: RobinRadar Systems B.V, SkyEcho V.O.F.

WP 1.4 Efficient, resilient and holistic management of passenger flows in airport terminals
Lead: Delft University of Technology | Participant: RTHA B.V., To70 B.V.

WP 2.1 Vortex Prediction for Take-off
Lead: SkyEcho V.O.F. | Participant: To70 B.V., Delft University of Technology, RTHA

WP 2.2 Data driven approach for flight delay prediction & flight-to-gate planning
Lead: Delft University of Technology | Participant: RTHA B.V., ADECS Airsystems B.V.

WP 2.3 Call-to-Gate Strategy
Lead: To70 B.V. | Participant: Delft University of Technology, RTHA B.V.

WP 2.4 Pilot External Bagage Check-In
Lead: Bagchain B.V. | Participant: RTHA B.V., Delft University of Technology, iLabs Technologies B.V. | Outside the project participants: Transavia, British Airways, Aviapartners

WP 3.1 (+1.3) Coupling Education to the Airport Technology Lab
Lead: iLabs Technologies | Participant: The Hague University of Applied Sciences, mboRijnland/CIV Smart Technology, Delft University of Technology

WP 3.2 Start-up Accelerator Program
Lead: World Startup Factory | Participant: Delft University of Technology

WP 3.3 Knowledge Dissemination
Lead: RHIA | Participant: All Partners

WP 1.1

Lead: ADECS AirSystems B.V. | Participant: RTHA B.V

OPEN AIRPORT PLATFORM

Digital transformation is the means to make airports more flexible, secure, innovative and sustainable. This transformation requires continuous innovation. Many innovations at airports are data driven products and services. To test and demonstrate these innovations in an operational airport environment a flexible and secure supporting ICT-infrastructure is required. To realise this infrastructure, we transformed our traditional AODB (Airport Operational DataBase) into an Open Airport Platform. This Open Airport Platform is an enabler for the Airport Technology Lab. RTHA is the pilot location for the development of this platform.

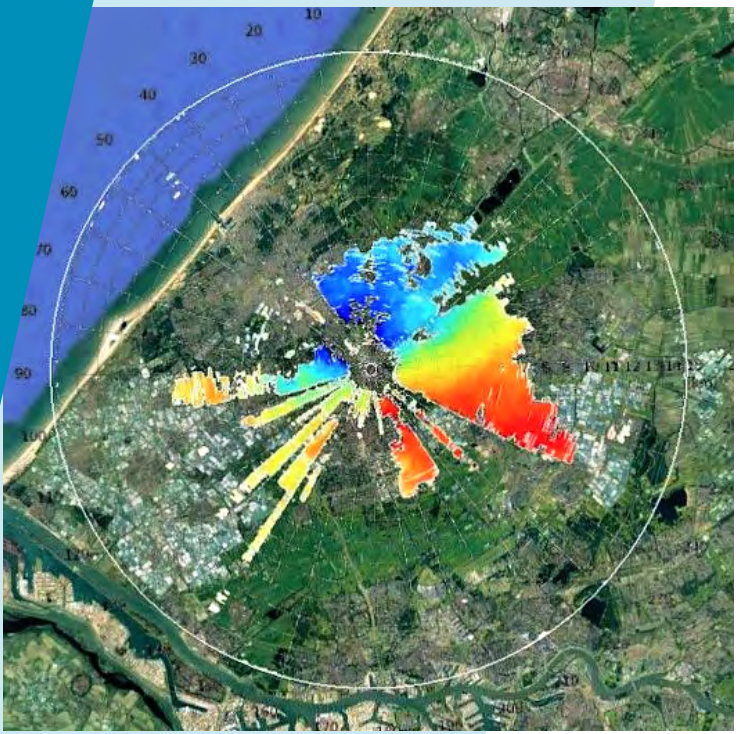
Apart from the realisation of the Open Airport Platform itself, the goal is to make the facility available for co-workers, students and start-ups for educational purposes and the development of new integrated products and extensions of the platform.

The traditional AODB we started with has been transformed in the past years into an Open Airport Platform that is now operational at RTHA. A number of innovations have already been successfully coupled to the platform using the new functionality the open platform offers. Also new developments based on data that can now be delivered by the open platform are planned.

WP 1.2

Lead: Delft University of Technology | Participant: RobinRadar Systems B.V, SkyEcho V.O.F.

AIRSIDE 4D WEATHER MAPPING



The image illustrates the rain coverage that was measured at a specific height with the 3D radar system at Rotterdam The Hague Airport and fitted to the map. The colours represent the values of radial (Doppler) velocities, which can be used for the estimation of wind velocity and direction at the airfield and above.

This project investigates the possibility to update the radar systems for birds and drone detection with a new weather sensing capability. This new sensing functionality includes the detection, tracking, and intensity estimation of rain and other precipitation. The special Doppler processing of weather-echo signals also gives the possibility to measure the wind velocity and direction in real-time. The resulting sensing information can be directly used within the airport's air-traffic management service to improve real-time weather condition awareness and, finally, flight safety.

The Robin Radar Systems' 3D phased array MAX radar operating at RTHA, has been selected for the proposed update implementation and testing. At its current configuration, this radar has very high scanning rate – 60 rotations per minute – that results in a fast update of sensing information but impossibility to measure the object's velocity with reasonable accuracy. Using the raw signals that were collected with this radar during specific rain events, the Microwave Sensing, Signals and Systems (MS3) group (http://radar.tudelft.nl) from Delft University of Technology implemented the real 3D Doppler processing of weather signals for the first time in Europe. This implementation demonstrates the improved sensitivity of the radar system to detect the weak radar targets, including the spatially-distributed areas of precipitation, and an advantage of new capability to measure the objects' velocity. The developed novel highly accurate model-based algorithm for the estimation of weather objects Doppler spectrum is a serious breakthrough in the radar sensing technology that provides better accuracy, and is faster than any existing estimation methods.

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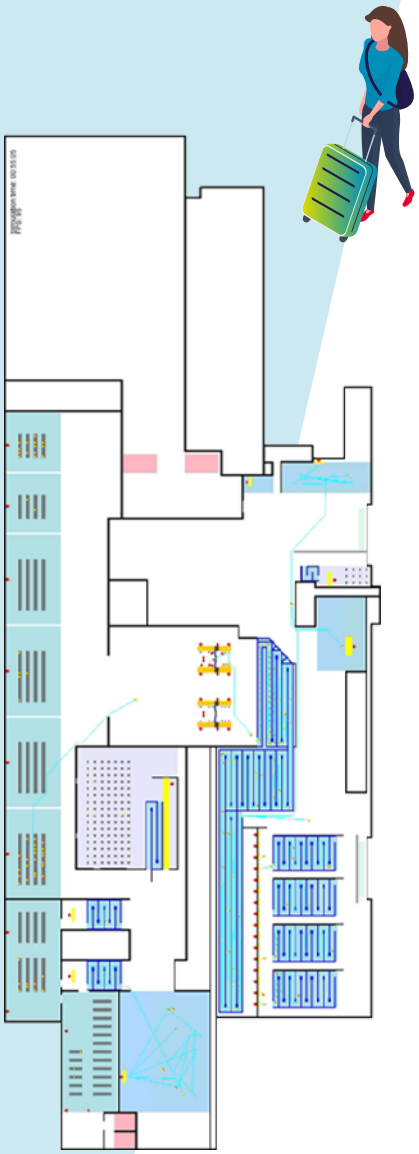

WP 1.4

Lead: Delft University of Technology | Participant: Rotterdam The Hague Airport B.V., To70 B.V.

EFFICIENT, RESILIENT AND HOLISTIC MANAGEMENT OF PASSENGER FLOWS IN AIRPORT TERMINALS

The purpose of this project is to develop methods and tools for efficient and resilient passenger flow management at the departure halls, lounges and gates of an airport, taking into account performance goals and commercial interests of the airport, flight schedules, arrival time of the passengers, behaviour, goals and values of the passengers.

To address this challenge, the agent-based simulation tool called AATOM was developed at the faculty of aerospace engineering of Delft University of Technology, in which all airport terminal processes and actors were modelled in a holistic manner, with a high degree of detail and realism.

Using this tool, terminal processes of Rotterdam the Hague airport were modelled. In particular, a 'call-to-gate strategy' application was developed to explore the effects of different call-to-gate strategies for passengers on the diverse aspects of airport performance. Automated tools based on machine learning techniques were developed to speed up large-scale simulations so that they could be used in real-time decision support tools for airport managers.

All developed methods and tools are modular and could be customised for different airports.

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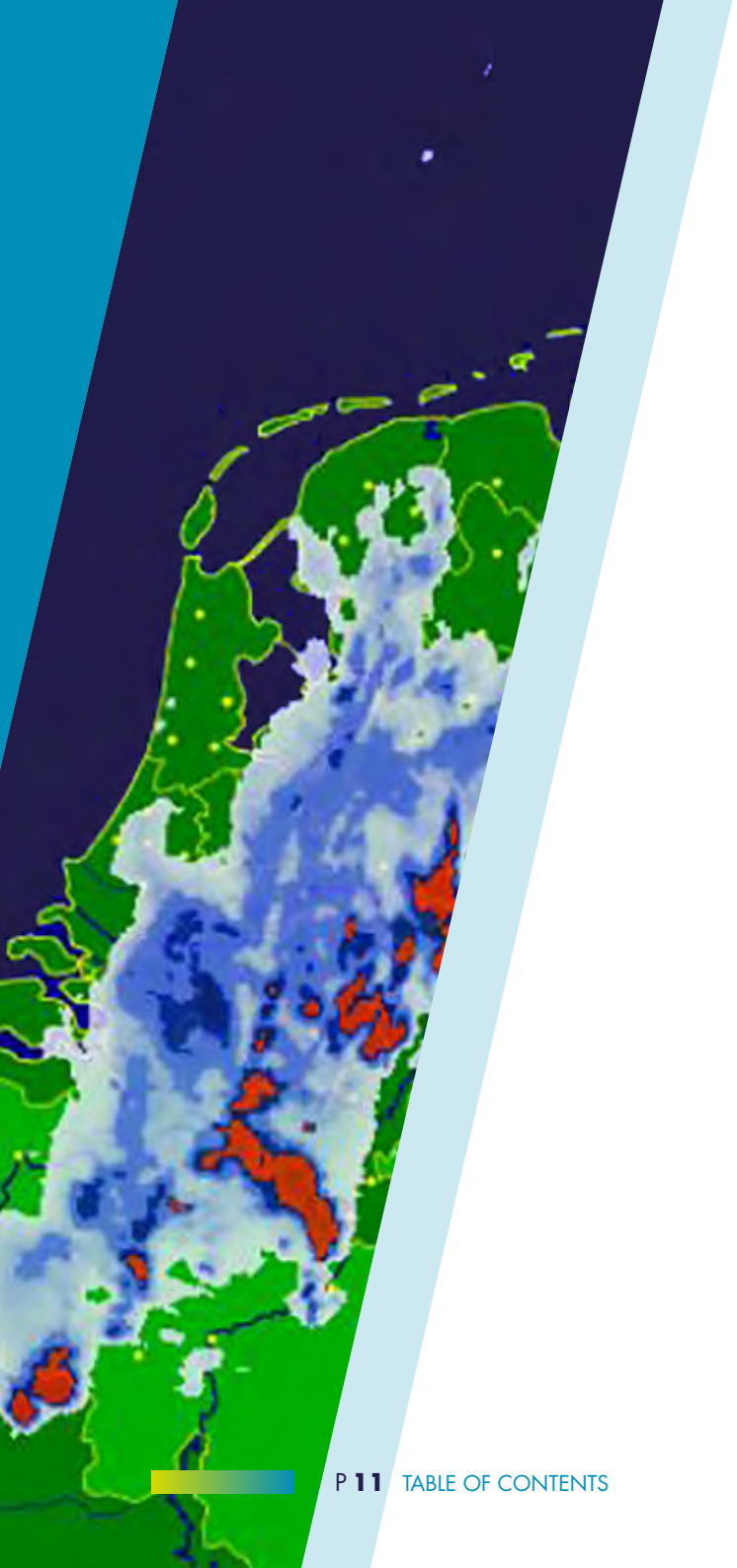

WP 2.1

Lead: SkyEcho V.O.F. | Participant: To70 B.V., Delft University of Technology, Rotterdam The Hague Airport

VORTEX PREDICTION FOR TAKE-OFF

We want to support the mitigation of adverse weather effects on airport operations, by developing the next generation of hyperlocal weather insights adapted for airport stakeholders. To do so, inial steps are done in the project to design and test a novel approach that combines mul-sensor synergy and the conversion of an advanced 3D phase-array radar (Max FMCW Radar from Robin Radar), initially used for bird detection, into a hybrid bird/weather monitoring system. During this project:

- Main challenges for air traffic control have been evaluated *(together with To70)*
- Inial evaluation of the Max radar has been performed *(together with Delft University of Technology)*
- An online weather platform demo has been designed and built. It will be showcased at the mini expo during the event.

WP 2.2

Lead: Delft University of Technology | Participant: Rotterdam The Hague Airport B.V., ADECS Airsystems B.V.

DATA DRIVEN APPROACH FOR FLIGHT DELAY PREDICTION & FLIGHT-TO-GATE PLANNING

In order to reduce the effect of flight delays on airport operations and personnel workload, we have developed Machine Learning algorithms with the aim to predict flight delays at Rotterdam The Hague Airport based on flight schedule data. The algorithms output a probability of occurrence for any delay value for any flight. In addition to the extensive probability distribution outcomes, a readily interpretable version of results was developed in the form of a traffic light system, indicating the likeliness of delay for a flight.

The developed predictions for flight delays have been applied in a use-case of flight-to-gate assignment. In working towards automation of airside resource planning, creating and updating the flight-to-gate assignment using mathematical models can aid airport planners in their work. The flight-to-gate assignment problem has been formulated as a linear programming model. By using the predicted delay distributions of the flights when creating the assignments, the probability of gate conflicts due to delayed flights can be controlled.

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WP 2.3

Lead: To70 B.V. | Participant: Delft University of Technology, Rotterdam The Hague Airport B.V.

CALL-TO-GATE STRATEGY

To70 has been leading and supporting two of the projects within Airport Technology Lab with our (operational) aviation expertise: the high-detailed weather information project and the agent-based terminal modelling project. In both projects, To70 focused on providing the use cases and stakeholder management, but also has been working on the development of the tools created within the projects. To70 is one of the initiators of the high-detailed weather information project. Our role was to make sure that the results of the projects would be of good use to the airport stakeholders.

Together with Delft University of Technology and SkyEcho we have been able to determine which high-detail meteorological data would be of most interest for airport stakeholders and what the benefits would be.

To70 collaborated with Delft University of Technology to further develop their agent-based terminal modelling tool and to perform the call-to-gate pilot project. Together with RTHA and their stakeholders, we analysed how Rotterdam The Hague Airport can optimize revenue from shops and restaurants while ensuring efficient operations and without compromising passenger experience. This project resulted in awareness among the airport stakeholders on how the actions of each individual stakeholder affects other stakeholders and how this can be optimized using a holistic approach.

WP 2.4

Lead: Bagchain B.V. | Participant: Rotterdam The Hague Airport B.V., Delft University of Technology, iLabs Technologies B.V. | Outside the project participants: Transavia, British Airways, Aviapartners

PILOT EXTERNAL LUGGAGE CHECK-IN

BAGCHAIN

The objective of this subproject is to enhance the check-in process for checked baggage in the departure hall and hand baggage at the gate. Bagchain, in close collaboration with Delft University of Technology, aims to test this remote baggage check-in system in the terminal of Rotterdam The Hague Airport to investigate the optimal locations for offering this check-in method to passengers and evaluate its impact on passenger flows and experiences in the departure hall and at the gate.

ILABS

Within the Airport Technology Lab, iLabs Technologies is engaged in a project that focuses on three key areas: integration of Biometrics and Digital Identity Wallets with Remote luggage check-in for safe and seamless travel, building a testbed for Digital Identity Wallets interoperability testing, and fostering collaboration with educational institutions.

Our first objective is to enable seamless and secure travel experiences by integrating biometric technologies with Bagchain. Through the use of cutting-edge technologies like artificial intelligence, cryptography and biometrics, we aim to streamline passenger flows. By allowing passengers to check-in in advance and utilizing facial recognition at various touchpoints, such as baggage check-in, security screenings, and boarding gates, we ensure a convenient travel process..

Additionally, we are developing a testbed to evaluate and refine the implementation of Digital Identity Wallets. These wallets are considered a fundamental technology for building a reliable and sustainable digital economy and society. By collaborating with government bodies, businesses, research institutions, and educational establishments, we aim to address concrete calls-to-collaborate and focus on developing a European Digital Wallet. This wallet will leverage biometric data and adhere to future European Digital Identity Wallet standards, enhancing both security and convenience in travel.

Moreover, iLabs Technologies is supporting the organization of the final Airport Technology Lab event, the Airport Technology Lab Showcase Event. This event will showcase our achievements and innovations resulting from collaborative efforts. We also actively engage with schools, colleges, and universities to foster cooperation and knowledge exchange. By involving educational institutions, we nurture talent, inspire future generations, and ensure the continuity of research and development in digitalisation for a sustainable and smart aviation industry.

In summary, our project within Airport Technology Lab aims to create international cooperation for internet security and trust in the digital economy. Through integration with Bagchain, building a testbed for Digital Identity Wallets, and collaborating with educational institutions, we strive to revolutionize travel experiences and public services, while building a safer and more efficient future for all.

WP 3.1 (+1.3)

Lead: iLabs Technologies | Participant: The Hague University of Applied Sciences, mboRijnland/CIV Smart Technology, Delft University of Technology

COUPLING EDUCATION TO THE AIRPORT TECHNOLOGY LAB

DELFT UNIVERSITY OF TECHNOLOGY

As part of the Airport Technology Lab knowledge and dissemination program, students of various education levels (WO, HBO and MBO) are actively involved, with the goal to facilitate collaboration and knowledge exchange between industry and students. Airport Technology Lab enabled our students to work on cutting edge and actual airport technology projects, and allowed students with different backgrounds to apply theoretical and design knowledge into practice.

Since the start of Airport Technology Lab a wide variety of Delft University of Technology MSc graduation projects, and bachelor and master courses projects have been set-up to support the involved researchers and companies. Students have been linked to one of the Airport Technology Lab innovation projects, and/or got the opportunity to work on broader airport challenges brought in by the Airport Technology Lab partners and network.

The faculty of Industrial Design Engineering has a strong involvement in this program via both its Bachelor and Master program (3 MSc tracks). A wide variety of courses have been linked so far, and resulted in a recuring collaboration with 7 Airport Technology Lab partners (Rotterdam The Hague Airport, To70, SkyEcho, RHIA, Delft University of Technology, bagchain, Ilabs Technologies) in 5 different courses. Students came up with solutions and designs for mobile check-in solutions, seamless travel across Europe with Digital Identity Wallets, Safe passenger walk-ways on airside, consumer interfaces for rain forecasting technology, and multi-functional drones in urban areas amongst others.

In addition, multiple students from the faculty of Aerospace Engineering and Electrical Engineering, Mathematics & Computer Science have carried out MSc graduation projects and Summer internships focussing on radar technology & weather now casting, as well development of the agent-based simulation tool to improve airport terminal operations & passenger flows.

As a result, Delft University of Technology has involved over 120 students, and delivered more than 60 different project outcomes within the Airport Technology Lab knowledge and dissemination program.

WP 3.1 (+1.3)
Coupling education to the Airport Technology Lab

MBO RIJNLAND, ILABS

The Airport Technology Fieldlab is a collaborative platform where educational institutions and entrepreneurs join forces to implement new services and products while equipping future employees with the necessary skills. It encompasses diverse student projects focused on cutting-edge topics, such as smart airport technologies, sustainability, airport security, passenger experience, air traffic control, drone integration, data analytics, and innovation in general airport challenges. Additionally, research and innovation projects leverage specialized skills like data analytics, artificial intelligence, blockchain, software testing, user experience design, and gaming and simulation to address broader airport issues. This enables companies to explore the latest technological possibilities offered by academia and vocational education, fostering innovation and collaboration within the airport industry.

THE HAGUE UNIVERSITY OF APPLIED SCIENCES

The passenger load factor is a measure of efficiency, and it is used to describe how well an airline performs. A high load factor indicates that an airline has sold most of its seats, while a low load factor can cause concern for many airlines. Airlines provide the passenger load factor 1-3 days beforehand, while the airfield plans duty rosters months in advance. In literature, little is known about the prediction of future visitors. Therefore, it was necessary to develop a method to predict the total number of visitors on a given day. The goal for this method is that the owners can optimally plan employee allocation and optimize operations to maximize revenue.

Airports have been collecting data for a long time. However, the collected data is not been appropriately used yet. Right now, the passenger load factor is being predicted by simply guessing. The airport wants to accurately predict the passenger flight load because the airlines give them the passenger list 1- 3 days before the flight, which is far too late. At the same time, the rosters must be made months beforehand.

Our project aims to see how machine learning can be used to predict the future passenger load factor of flights so that it can be used to assign airport resources like work rosters and security. This research aims to come up with an algorithm that can be used for passenger load factor prediction.

To provide the client with an algorithm, machine learning is used. Machine learning allows computers to learn and is mainly used for regression and classification. Besides that, it is also used for prediction. Our model is now capable to predict the number of passengers going through the terminal one season in advance unto 90% accuracy.

WP 3.2

Lead: WorldStartup | Participant: Delft University of Technology

START-UP ACCELERATOR PROGRAM

WorldStartup is supporting startups with a solution that can be applied in the aviation industry to make it more sustainable and hospitable. Startups are being introduced to partners of the Airport Technology lab and are invited to join meetings and workshops to better understand the industry and its challenges, which enables them to improve their proposition. They have the possibility to receive guidance from a mentor or business coach; join trainings like the Market Readiness Training or join one of WorldStartups support programs.

WP 3.3

Lead: RHIA | Participant: All Partners

KNOWLEDGE DISSEMINATION

Since the start in 2019, The Airport Technology Lab has been at the forefront of the many projects initiated by RHIA and its partner community. As project leader, RHIA is responsible for the overall execution and delivery of the underlying activities of the Airport Technology Lab. We have played a crucial role in realizing the goals from the original project plan and streamlining the work of the involved partners, and then translating them into actionable activities for Airport Technology Lab partners and the RHIA community.

By leveraging the expertise of our community in aviation and airport operations, we collaborate with many stakeholders, including industry experts, government bodies, research institutes and technology providers, to foster the transition towards more smart and sustainable airport operations.

We look forward to shaping the further development of Airport Technology Lab with new and existing partners, we invite you to join us in this exciting journey.

IN SIGHTS

The success of any collaboration or partnership lies in the diversity of experiences and expertise brought together by different partners. Each partner brings a unique perspective, knowledge, and skill set to the table, contributing to a richer and more comprehensive approach. This is particularly true in the context of the Rotterdam The Hague Innovation Airport (RHIA) program, where collaboration between Rotterdam The Hague Airport (RTHA) and the municipality of Rotterdam is paramount.

By involving partners with different backgrounds, such as airport operators, local authorities, research institutions, technology providers, and other stakeholders, the program can tap into a wide range of perspectives and expertise. Each partner brings their own insights and experiences, enabling a holistic understanding of the challenges and opportunities in the aviation sector.

Bringing these diverse partners together is crucial for fostering innovation and driving positive change. The exchange of ideas, knowledge sharing, and collaboration among partners with different backgrounds create fertile ground for innovative solutions to emerge. By working together, partners can leverage their respective strengths and overcome complex challenges more effectively. This collaborative approach enables a comprehensive and sustainable impact on airport surroundings, benefiting the aviation industry, the environment, and the communities involved.

Next, you will find some key partners' interviews to get an insight into what they have done for the project.

INSIGHTS FROM ADECS

Helmut ten Have | Consultant, Adecs Air Systems

1 CAN YOU EXPLAIN THE ROLE OF ADECS WITHIN THE AIRPORT TECHNOLOGY LAB CONSORTIUM AND HOW IT CONTRIBUTES TO THE OVERALL OBJECTIVES?

The role of Adecs in the Airport Technology Lab consortium is to facilitate the exchange of flight and airport data for the Airport Technology Lab-consortium members with the goal to improve the airport operational processes and enable data-driven innovation projects. Many regional airports struggle with facilitating such data exchange because integration options for their legacy operational airport databases are limited or come at a high cost. Partially because their systems are outdated, but also because of vendor lock-in. This impends innovations at these airports as innovators are unable to easily integrate, test and prove their solution without the direct involvement of the Airport Operational DataBase (AODB) supplier. We envisioned an open AODB system that allows innovators to integrate their solutions without the need of our involvement. In the past years, we have been gradually transforming our AODB into an open airport platform.

2 WHAT CHALLENGES HAVE YOU BEEN WORKING ON IN THE PAST YEARS OF AIRPORT TECHNOLOGY LAB?

During the Airport Technology Lab project we transformed our AODB into an open airport platform. This required fundamental changes and a complete redesign of the solution. We completely rebuilt our back-end to enable real-time and created industry standard interfacing options via ESB and RESTapi. The complete rebuild was performed while maintaining and releasing software updates for our existing customers. So, in the true spirit of Airport Technology Lab, the solution has already been proven in the field. Not only at Rotterdam The Hague Airport, but also at 6 other regional airports.

3 WHAT OPPORTUNITIES DO YOU FORESEE FOR OTHER STAKEHOLDERS INVOLVED IN REGIONAL AIRPORTS? HOW CAN THEY BENEFIT FROM THIS COLLABORATION?

The open airport platform provides the means to enable real-time integration and data-driven interaction. It enables stakeholders to field their data-driven products and services. It removes long existing entry barriers to the market, and therewith hopefully accelerating innovation at regional airports for the greater good.

> "SO, IN THE TRUE SPIRIT OF AIRPORT TECHNOLOGY LAB, THE SOLUTION HAS ALREADY BEEN PROVEN IN THE FIELD."

4 COULD YOU HIGHLIGHT THE MOST SIGNIFICANT RESULT THAT HAS BEEN ACHIEVED THROUGH THE WORK OF THE AIRPORT TECHNOLOGY LAB CONSORTIUM?

The highlight of our work is that all our customers now operate an up-to-date version of our Open Airport Platform AirLink 5. We are particularly proud that the complete upgrade during the past few years has not caused any operational disruptions, although a major operation has taken place.

Furthermore, 2 external applications were realised by an external partner using the new API. This shows that the open architecture actually works in practice. At Cornwall Airport Newquay, a mobile application was developed for the management of reduced mobility passengers. It uses flight- and PRM-related data from the AODB. Users are then able to record information about the journey of the PRM and feed this back into the AODB for reporting and analysis purposes. At Bonaire International Airport a mobile application was developed to provide airport stakeholders with airport operational data.

And finally, we provided data to several Airport Technology Lab-partners and contributed our knowledge to scientific research and student projects which has let to several publications and graduation projects.

"HIGH-QUALITY DATA IS THE KEY FOR DATA-DRIVEN INNOVATIONS."

5 AS A MEMBER OF THE CONSORTIUM, WHAT HAVE BEEN THE KEY INSIGHTS OR LESSONS LEARNED THAT HAVE HAD THE GREATEST IMPACT ON YOUR WORK?

The first important lesson we learned is that innovation involves technology, processes and people. Changing technology is the easiest part, changing the processes is harder but the true challenge comes to getting people on board. So, for any innovation project to succeed, the end-users should be involved from the beginning and see the benefits right from the start. Any process changes should be made gradually, as the airport operational environment does not allow for disruptive changes due to its continuous and highly regulated setting. New technology can be used, but one should be aware from the risk-adverse nature of the airport industry.

The second important lesson is that there are no widely used industry standards and accepted terminology within the airport industry. This affects the interchangeability of data and hinders innovation and collaboration. There should be more initiatives to create a common data standard and terminology.

6 LOOKING AHEAD, WHAT ARE THE FUTURE FOCUS AREAS THAT THE AIRPORT TECHNOLOGY LAB AIMS TO PRIORITIZE? HOW DO YOU ENVISION THE LAB'S DIRECTION IN THE COMING YEARS?

High-quality data is the key for data-driven innovations. As data gathering and quality assurance at regional airports is mostly a manual process, it is very labour-intensive and provides suboptimal data quality. Other industries already made the transition to automated data acquisition, improving both data quality and quantity. It is a logical next step for regional airports but still at its infant stages. Furthermore, we see opportunities in closer collaboration between the airport stakeholders (operator, handlers, ATC) but also between the airports. All parties are inter-dependent and use similar data, but true collaboration and data-sharing is still limited. To accomplish this, one of the enablers should be a common data standard and terminology.

INSIGHTS FROM TO70

Desley Kemper | Senior Aviation Consultant, To70 Aviation

1 CAN YOU EXPLAIN THE ROLE OF TO70 WITHIN THE AIRPORT TECHNOLOGY LAB CONSORTIUM AND HOW IT CONTRIBUTES TO THE OVERALL OBJECTIVES?

To70 has been leading and supporting two of the projects within Airport Technology Lab with our (operational) aviation expertise. In general, To70 focused on providing the use cases and stakeholder management within the projects, but also has been working on the development of the tools created within the projects.

2 WHAT CHALLENGES HAVE YOU BEEN WORKING ON IN THE PAST YEARS OF AIRPORT TECHNOLOGY LAB?

To70 has been working on the high-detailed weather information project and the agent-based modelling tool to perform the call-to-gate pilot project.

3 WHAT OPPORTUNITIES DO YOU FORESEE FOR OTHER STAKEHOLDERS INVOLVED IN REGIONAL AIRPORTS? HOW CAN THEY BENEFIT FROM THIS COLLABORATION?

Airport Technology Lab has shown that collaboration between universities/ schools, software providers, start-ups, consultancy firms and the airport partners can lead to solving complex puzzles in a short period of time and strengthening the network within the region. Without Airport Technology Lab, the chance would be small that all these parties would be working together solving challenges that the airport is facing.

4 COULD YOU HIGHLIGHT THE MOST SIGNIFICANT RESULT THAT HAS BEEN ACHIEVED THROUGH THE WORK OF THE AIRPORT TECHNOLOGY LAB CONSORTIUM?

Developing the call to gate strategy using the Agent Based Modelling tool for the terminal (collaboration between Delft University of Technology and To70). This tool will help RTHA to balance their commercial and efficiency goals as well as simulate future traffic forecast.

5 AS A MEMBER OF THE CONSORTIUM, WHAT HAVE BEEN THE KEY INSIGHTS OR LESSONS LEARNED THAT HAVE HAD THE GREATEST IMPACT ON YOUR WORK?

Our main lessons learned is that you can really benefit from using the extensive network of parties within Airport Technology Lab, but only with a good communication flow. Given all the challenges that arose during the project (Incl. COVID-19 pandemic), this has been difficult at times and is definitely something to learn from for future projects.

> "PARTNERS CAN LEAD TO SOLVING COMPLEX PUZZLES IN A SHORT PERIOD OF TIME."

6 LOOKING AHEAD, WHAT ARE THE FUTURE FOCUS AREAS THAT THE AIRPORT TECHNOLOGY LAB AIMS TO PRIORITIZE? HOW DO YOU ENVISION THE LAB'S DIRECTION IN THE COMING YEARS?

Airports are facing numerous challenges, but I think the ATL consortium can continue to contribute in solving them. Our future focus areas would be optimization of flows (pax, baggage, airside movements) through forecasting tools, transition to energy hub (for the airport and the region) and accelerating electric and hydrogen aviation.

INSIGHTS FROM THE DELFT UNIVERSITY OF TECHNOLOGY

Elise Bavelaar | Project Manager Airports, Delft University of Technology

1 CAN YOU EXPLAIN THE ROLE OF DELFT UNIVERSITY OF TECHNOLOGY WITHIN THE AIRPORT TECHNOLOGY LAB CONSORTIUM AND HOW IT CONTRIBUTES TO THE OVERALL OBJECTIVES?

Delft University of Technology has a strong role in the consortium, as we are involved in the vast majority of innovation & pilot projects that have been carried out. Our researchers, coming from different disciplines, have developed various algorithms, simulation & decision support tools for several applications. By bringing in our knowledge, and working closely together with the Airport Technology Lab partners, we aim to speed up the innovation process, and implementation of groundbreaking solutions into society, living up to Delft University of Technology's motto 'Impact for a better society'.

"FOR STUDENTS IN PARTICULAR IT OFFERS A GREAT PLATFORM TO WORK ON ACTUAL AIRPORT RELATED PROBLEMS."

2 WHAT CHALLENGES HAVE YOU BEEN WORKING ON IN THE PAST YEARS OF AIRPORT TECHNOLOGY LAB?

As mentioned, we were involved in many projects. Examples of projects are airside 4D-weather mapping, flight delay prediction, and management of passenger flows in airport terminals. In addition, we have used the opportunity to link broader Airport Technology Lab's challenges to our educational program. Students were able to design solutions for new mobile check-in applications, seamless travel using digital identity wallets, but also multi-functional drones for urban areas amongst others.

3 WHAT OPPORTUNITIES DO YOU FORESEE FOR OTHER STAKEHOLDERS INVOLVED IN REGIONAL AIRPORTS? HOW CAN THEY BENEFIT FROM THIS COLLABORATION?

There are many challenges to be solved in this field. I think Airport Technology Lab is a great showcase, in which we are able to show the benefits of having access to airport data, a set of collaboration partners, and an opportunity to test our solutions and ideas in a digital and/or real airport environment.

4 AS A MEMBER OF THE CONSORTIUM, WHAT HAVE BEEN THE KEY INSIGHTS OR LESSONS LEARNED THAT HAVE HAD THE GREATEST IMPACT ON YOUR WORK?

There are many lessons learned, but key is the importance of involving different stakeholders in the innovation process, already from the start of the project.

5 COULD YOU HIGHLIGHT THE MOST SIGNIFICANT RESULT THAT HAS BEEN ACHIEVED THROUGH THE WORK OF THE AIRPORT TECHNOLOGY LAB CONSORTIUM?

The work of the consortium achieved several significant results. For Delft University of Technology, participating in Airport Technology Lab is a valuable opportunity to involve many different researchers and students, and work on multiple interesting topics. For students in particular it offers a great platform to work on actual airport related problems. A key part in all is the Airport Operational Database from Rotterdam the Hague Airport, developed by Adecs, which enables partners and researchers to use data for innovation purposes.

6 LOOKING AHEAD, WHAT ARE THE FUTURE FOCUS AREAS THAT THE AIRPORT TECHNOLOGY LAB AIMS TO PRIORITIZE? HOW DO YOU ENVISION THE LAB'S DIRECTION IN THE COMING YEARS?

The Airport Technology Lab can support developments in many areas. In addition to continuation of current topics, I also see a need for a stronger focus on sustainable and autonomous airport operations.

OUR PARTNERS

The Airport Technology Lab project brings together an array of diverse partners, each playing a vital role in driving innovation and advancement in the aviation industry. From airport operators and technology providers to research institutions and industry experts, these partners collectively contribute their unique expertise and insights to the lab. With a shared vision of transforming airport processes and management, they collaborate closely to develop cutting-edge solutions that optimize efficiency, enhance sustainability, and improve passenger experiences. Through this collaborative effort, the partners in the Airport Technology Lab project are revolutionizing the future of airports and shaping the way we travel. Have a look at our partners!

ADECS AIRINFRA

Adecs Airinfra was established in 2000 as a spin-off Delft University of Technology, dedicated to consultancy services and IT solutions for airports. We ensure the highest levels of certainty and satisfaction through a deep-set commitment to our clients, comprehensive industry expertise and the skills of our seasoned IT professionals in delivering solutions powered by the latest technology and innovation. Innovation and sustainable development are at the core of our products and services. Our products and services are developed according to global standards and the latest recommendations of the field of aviation and IT.

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bagchain

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From the core we are a software company. Offering software services and Apps for the travel industry. At the same time we developed a line of mobile baggage check-in kiosks. Fully touch-less and super simple and fast to operate. Innovative as they are connected to our eco-system bagchain cloud. It means they can be operated anywhere in the world. Setting up a kiosk in minutes without expensive certifications and high costs compared to the legacy systems. Yes we are the new kid on the block! Although we have a lot of experience and knowledge of the various systems.

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ILABS

iLabs Technologies B.V. is a Rotterdam-based company specializing in innovative software solutions. Our expertise lies in deep-tech areas such as artificial intelligence, digital identity ,cryptography, and biometrics. We focus on creating a secure and seamless travel experience, as well as facilitating easy access to events, concerts, and museums. Through our Valuetrack People Flows initiative, in collaboration with the Ministry of Economic Affairs, we foster international cooperation and develop a digital ecosystem where government, businesses, research institutions, and individuals collaborate on concrete projects. Our goal is to build a European digital wallet ecosystem, considered a key technology for establishing a reliable, inclusive, and sustainable digital economy and society.

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Smart Technology

Centrum voor
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Smart Technology

MBO RIJNLAND

Center for Innovative Craftsmanship (CIV) Smart Technology is dedicated to the continuous development of innovative education within the Technical & ICT programs at mboRijnland. CIV ST achieves this by bridging the gap between education and industry, allowing students to work on (new) skills and innovative assignments, implementing advancements across all programs at the College of Technology & ICT, and further developing elective courses. The focus lies on key themes such as digitalization, energy transition, and circular economy. Join us in shaping the future of education and preparing students for the challenges of tomorrow's world.

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RHIA

The City of Rotterdam along with Rotterdam The Hague Airport are the initiators of RHIA. With the establishment of the Rotterdam The Hague Innovation Airport Foundation in May 2019, they have made it their mission to tackle the economic, social and sectoral challenges of aviation through an holistic approach, and make aviation more sustainable, silent and smart.
RHIA is one of the innovation programs of the City of Rotterdam. By boosting innovations, stimulating new jobs and socio-economic cluster development, RHIA facilitates and accelerates the economic transition.
For Rotterdam The Hague Airport (RTHA), RHIA is a way to realize one of the four strategic outlines: developing the airport into an innovation partner, so that it can act as a catalyst for the sustainable development of the airport area and, if possible, the region as well.

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RHIA

ROTTERDAM THE HAGUE AIRPORT

Rotterdam The Hague Airport is a regional airport at TEN-T core network with 2,1 million passengers and 52,000 movements in 2019. It has created an 'innovation lab' environment to allow state-of- the-art operations of new solutions at an operational airport allowing the Royal Schiphol Group to test and develop future operations for airport hubs.

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Sky ECHO
HD weather experts

SKY ECHO

SkyECHO develops advanced actionable weather intelligence services, at local scale, to support cities and businesses in their climate adaptation and mitigation of weather disruptions. At SkyECHO, we firmly believe that the accuracy of weather data is lacking to face the future increase of weather extremes. Our aim is therefore to weatherise local activities with the most trustable weather information available on the market.

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TO70

To70 is a global research and consultancy company that helps public-sector bodies and the global aviation industry to cope with today's problems. To70 was founded in The Netherlands in 2000 and has since expanded with offices in Europe, Australia, Asia and South-America. Our clients include airports, airlines, governments and air navigation service providers. At To70 we believe that society's demand for transport and mobility can be met in a safe, efficient, environmentally friendly and economically viable manner. To achieve this, policy and business decisions have to be based on objective information. With our diverse team of specialists and generalists To70 provides pragmatic solutions and expert advice, based on high-quality data-driven analyses.

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DELFT UNIVERSITY OF TECHNOLOGY

Top education and research are at the heart of the oldest and largest technical university in the Netherlands. Delft University of Technology has 8 faculties and offers 16 bachelor and more than 30 master programmes. Our more than 28,000 students and 6000 employees share a fascination for science, design and technology. Our common mission: 'impact for a better society'.
Within the Airport Technology Lab multiple organisations from Delft University of Technology are involved:

1. Faculty of Aerospace Engineering, Air Transport & Operations group
2. Faculty of Electrical Engineering, Mathematics, and Computer Science: Microwave Sensing, Signals and Systems group
3. Faculty Industrial Design Engineering
4. Innovation and Impact Centre

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WORLDSTARTUP

At WorldStartup, we believe that an inclusive and regenerative economy is the way forward for a sustainable world. Our goal is to catalyse positive growth in every corner of the world by promoting the power of collaboration and equality. We work with local leaders in a global network, build ecosystems together, and celebrate changemakers.

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WorldStartup

JOIN US IN SHAPING THE FUTURE

OF AIRPORT TECHNOLOGY!

Become a part of the further development of the Airport Technology Lab of Airport Technology Lab 2.0, the premier platform for collaboration between knowledge instituteseducational institutions, entrepreneurs, and industry leaders, and SME's. Together, we can revolutionize the airport experience, implementing cutting-edge digital innovations and developing the skills needed for tomorrow's workforce. Whether you're an educational institution offering expertise in data analytics, artificial intelligence, or blockchain, or an airport seeking to enhance efficiency, sustainability, or passenger services, Airport Technology Lab 2.0 is the place to be. Additionally, Let's explore the next steps togetherfor RHIA (Research & Innovation in Airport Technology), where we apply specialized skills to address broader airport challenges.
Special thanks goes out to Rotterdam The Hague Airport for hosting these Airport Technology Lab innovations. Join us today and let's explore the next steps together and be with us at the forefront of digitalof the digital innovation airport technology revolution!

www.stichtingrhia.nl

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