IATA GLOBAL AIRPORT & PASSENGER SYMPOSIUM

Warsaw, Poland
15 - 17 October 2019

Building Capacity for the Future
Transforming Airport
Nina Brooks, Director – Security, Facilitation and IT, ACI World
Paul Hermans, Senior Airport Planner, Arup
Marco Plarre, Technical Director – Airport Planning, Jacobs
Ombretta Russo, Airport Planning Manager, ADP Ingénierie

MODERATOR: Anne Carnall, Program Manager, NEXTT, IATA
THE FUTURE OF TURNAROUND - ACDM

John Degiovani, Managing Director of Corporate Quality, Regulatory, Analytics, Health and Safety, United Airlines
Uschi Schulte-Sasse, SVP Aviation, INFORM-GmbH
Max Diez, Chief Executive Officer, Assaia – The Apron AI
Fabio Gamba, Director General, ASA

MODERATOR: Joseph Suidan, Head of Ground Operations, IATA
A-CDM
An Update

Chris Dodson
Secretary IATA AACG

(Airline A-CDM Coordination Group)
A-CDM – An Update

• What’s AACG
• What’s happening with A-CDM globally
• How is AACG Responding
IATA AACG

- Airline A-CDM Coordination Group (AACG) is tasked with guiding the global rollout of A-CDM, addressing the airlines difficulties with unharmonized processes and procedures in A-CDM implementation
- Formed in Dec 2015, comprising 11 airline reps, meeting twice a year
- AACG Goals:
  - Harmonize A-CDM rules and processes globally, through the development of policies and strategies
  - Reduce complexity from the business and deliver efficiency and delay reduction
  - Ensure A-CDM works for airlines, airports and the network
  - A single voice to lead and collaborate – driving education and transparency among global A-CDM partners
A-CDM – Globally

- Airports globally are experiencing similar choke points prompting A-CDM Implementations to achieve a step change:
  - Most replicated model of A-CDM is European Version

- Europe: 28 Current Implementations heading for 51
  - The Network Manager (Eurocontrol) developed A-CDM to improve airport processes (2010)

- AsiaPacific: 20 Current Implementations heading for 69
  - Multi-Nodal concept substituting for absence of Network Manager

- Other – Latin America, Canada, USA, Middle East
  - Plans evolving steadily
AACG – Activities

- Recommendation Papers (for Implementation) published 2017
- Working with Eurocontrol in the Harmonization Task Force from 2017
- Working with DECEA in Brazil on a regional implementation September 2019
- Reviewing and assisting with implementation plans
- Planning revised structure to create regional task forces – Europe, ASIAPAC, etc.
AACG – Emerging Activities

- Communication of A-CDM Data
- Alignment between A-CDM and Surface CDM in USA
- Refining TOBT
Improving Airline Performance with Technology: IATA Conference

John DeGiovanni
Managing Director – Corporate Quality Assurance, Compliance, Ground and Safety Analytics
United Airlines

November-2019
Technology is making us better...

▪ Performance
▪ Customer Service
▪ Integration
▪ Safety
▪ Cost

... in running a better business
Our technology map

- Data Viz
- Cloud & Edge Computing
- BIG DATA
- Predictive Safety
- Anomaly Detection
- Natural Lang Processing
- Augmented & Virtual Reality
- Blockchain Technology
- Automation & Auto Vehicles
- Computer Vision

2020s
Every minute counts…Technology is key

Constantly applying CI tools to improve safety, reliability, efficiency and customer satisfaction.

Source: Improving Ramp/Terminal Operations for Shorter Turn-Times
BOEING Corporation, AERO Magazine QTR 4.08, accessed in 13-SEP-2018
https://www.boeing.com/commercial/aeromagazine/articles/qtr_4_08/pdfs/AERO_Q408_article04.pdf
Optimizing turns with Computer Vision

- Monitor planeside risk hazards:
  - Safe to approach aircraft
  - Driving speeds, crossing vehicles.
  - OSZ clear, among other automated safety compliance audits

- Ground support equipment tracking, utilization and optimization

- Planeside flow-Reliability models

- All gates all turns compliance/performance

Real-time decision making.
Monitoring Turn Events

LAX_70b.mp4
Speed: 8x   Duration: 46:40

- **General**: Aircraft stationary, Pushback tug connected
- **Passengers**: Bridge connected
- **Service**: Catering aft connected
- **Luggage**: Unloading, Loading
Vision: what you need, in your hands 24x7

- Leverage technology and data
- Automated daily briefings
- Predictive safety capabilities
- Avoid communication fatigue
- Targeted site messaging

Finger tip integrated data
Tech Ops Automated Daily Safety Briefings

- Daily Safety information:
  - Tailored to specific location
  - 46 properties, 2X/day
  - Automated

- Daily brief teams on risk hazards

Transparency supports knowledge and awareness
Why can’t we have voice activated data?

- Voice makes communication easier
  - Hands-free/anytime or place
  - Completely mobile
  - More natural

- Universal access latest content
  - Policy questions
  - Reports/Alerts/Communication
  - Weather and ops safety tips
  - Fun!

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Most digital voice assistant users cite freeing up their hands as a major reason for adoption

<table>
<thead>
<tr>
<th>Major reason</th>
<th>Minor reason</th>
<th>Not</th>
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</thead>
<tbody>
<tr>
<td>Let me use the device without my hands</td>
<td>66</td>
<td>28</td>
</tr>
<tr>
<td>It's fun</td>
<td>23</td>
<td>30</td>
</tr>
<tr>
<td>Spoken language feels more natural than typing</td>
<td>22</td>
<td>37</td>
</tr>
<tr>
<td>It's easier for children to use</td>
<td>14</td>
<td>28</td>
</tr>
</tbody>
</table>

Note: Respondents who chose “not a reason” or did not give an answer for each option are not shown. Figures may add to more than 100% because multiple responses were allowed.

Data Visualization

- Complex > simplified
- Transparent
- Real-time access
- Power of a dot
- Data mining
- Universal
- Call for Action
Integrating Data-Holistic Pictures

Data Warehouse

- SAP
- Ops Analysis
- Weather
- LOSA
- Impacts
- VDRP
- Workers’ Comp
- QA Audits
- Utilization
- Equipment
- Excursions

Data Visualization Overlay

- Cost
- Injuries
- Damages
- LOIs

- Manpower
- Fuel
- Incursions

Trend/statistical analysis
Divisional breakdown
Daily/weekly/monthly reports
Station breakdown
Predictive (in progress)

Phase 1
- Incursions
- Equipment

Phase 2
- Fuel
- Manpower

Cost
Injuries
Damages
LOIs

SAP
Ops Analysis
Weather
LOSA
Impacts
VDRP
Workers’ Comp
QA Audits
Utilization

Trend/statistical analysis
Divisional breakdown
Daily/weekly/monthly reports
Station breakdown
Predictive (in progress)
Results – Success Stories

➢ Jet Bridge Overhaul
➢ Left Shoulder Lifting
➢ Catering Transportation
➢ Tel Aviv Problem

Jet Bridge Reliability

Food Prep Injuries

Body Map of Injuries

Drive Changes
In close: Technology is changing the world…

- Adopt – Don’t be left behind!
- Technology readily available
- Integration is key
  - Performance
  - Cost
  - People
- Be forward looking
- Have a plan

… and this is just the beginning
 Complexity & Unpredictability

Unpredictability:
- ad-hoc changes
- volatility
- time pressure

- few changes
- few disruptions
- ample planning time

Agile Optimization selectively supplements the existing IT with algorithms for operational decision making:

- **smart** optimization
  - mastering complexity
- **rapid** response
  - fighting volatility & time pressure
- **interactive** control
  - empowering decision makers

• standard processes
  - individual workflows
  - complex collaboration

Lean Management

Sophisticated Planning

Agile
Improvisation

Agile
Optimization

Management Strategies
The Future Turnaround

Turning increasing complexity into value creation
Corporate Vision: Sustainability

- **Sustainable World Impact**
  - fighting operational waste, fraud, carbon emissions

- **Sustainable Client Relationships**
  - 1986 Audi, 1986 Daimler, 1991 British Airways, etc.

- **Sustainable Employee Relationships**
  - 25+ years, empowering IT productivity
  - reliable, long-term client support

- **Sustainable Corporate Control**
  - internally owned: founder, directors, senior staff

- Sustainable Company Development
  - since 1985 cash flow fuelled, double digit growth
  - 32 consecutive years of profits, re-invested in R&D
THE APRON AI

Member Working Group
Ramp of the Future
Finalist
IATA IGHC Innovator Award
Winner
AAAE Airport Innovation Forum
Shortlist
Technological Solution of the Year
Background
Max Diez

University of St. Gallen
- Master in Strategy & Intl. Management

Shippo (San Francisco)
- Connect e-commerce merchants to shipping providers

Avrios (Zurich)
- Automate company vehicle fleet management

Assaia International Inc.
- Apron AI
- Make the apron more efficient, safer, and more sustainable.
ENORMOUS GROWTH

2017 → 2037

Number of commercial aircraft in operation to increase by ~110%

+48,000 aircraft

industry-wide incremental revenue $500bn

Sources: Airbus Global Market Forecast, Boeing Commercial Market Outlook.
PROBLEM

TURNAROUNDS = BLACKBOX

Poor data availability materializes in

degraded
OTP

suboptimal
asset utilization

excess
cost

unattributed
incidents
OUR SOLUTION

We feed ramp video* to AI to understand every turnaround and prevent incidents.
Background

- Gatwick Airport to be first production customer for Apron AI
  - Rollout across 3 piers
- Collaborative
  - Airlines & Ground Handlers get access to generated data
  - “the airlines and ground handlers [...] will be paying for the turn event data service”
- Goals
  - Improve OTP
  - More efficient utilization of stands & runway
A-CDM from a data perspective, dissected

- Data collection
- Data provisioning
- Data-driven ops & planning
Step #1: data collection

- Problems
  - No data
    - Most AODB data fields are empty
  - Subpar quality
    - Manual timestamps are unreliable
    - Sensors don’t always tell the truth
    - Lack of context about reliability/solidity of a data point (“confidence”, method of acquisition)
Automated vs. manual data collection

**before**  
60% of all data captured with a delay of >2 min

**after**  
100% of all data captured with a delay of <15 sec
Step #1: data collection

- Solutions
  - Decide which data points are essential, important, nice-to-have?
  - Understand how to capture these data points
    - Automatically
      - Sensors (don’t forget VDGS, jet bridges, etc. !)
      - Video analytics
    - Manually (app-based)
  - Use same definitions
Step #2: data provisioning

- Problems
  - Data not shared between stakeholders (e.g. between ground handlers & airlines)
    - For political reasons (accountability/transparency)
    - For technical reasons (lack of API)
  - Data not available to the right people at the right time (lack of interface)
Gatwick’s solution: The Community App
Step #2: data provisioning

- Solutions
  - Permission system (define which stakeholder can access which datapoint under which circumstances)
  - Provide User Interface
  - Provide APIs
Step #3: data-driven ops & planning

- Data itself has no value, it has to be used to drive better decisions.
- HARD HARD HARD problems (especially in real-time)
  - Qualifications (not every airport has a data science team)
  - Process change
  - Change of behavior
  - Greedy optimization
  - Conflicts of interest (we can accelerate 1 out of 3 turnarounds happening right now – which one should we choose?)
Step #3: data-driven ops & planning

- Wait, there’s MORE!
  - How do we optimize the entire network to minimize delays on the global level?
    - Is this even possible in a world with egoistic actors?
  - Should we cut humans out of the decision making process, and give AI all authority?
Outlook
Enable Autonomous GSE
VISIT OUR ONLINE DEMO:
www.assaia.com/tmc

Christiaan Hen
Chief Customer Officer
Phone: +31 63 01 73 342
E-mail: christiaan.hen@assaia.com
Ramp of the future
Human Factors

Fabio Gamba
Director General
Airport Services Association (ASA)
The Ramp of Today

IS MOSTLY MANUAL, SILOED AND LACKS INVESTMENT
Today’s HR challenges
ARE LACK OF RESOURCE AND HIGH TURNOVER

Job attractiveness
• Highly manual
• Operational and standardised
• Low salaries
• Lack of career path

Language challenges
Lack of equipment investment
Poor training

….and the rapid growth of the industry will result in an even greater lack of manpower
Current solutions can be costly

- Company culture
- Improved facilities and welfare
- Increased salaries
- Flexible working

Handlers, Airlines and Airports are showing signs of understanding, but there is still a relentless focus on price
Technology to the rescue?

- AI in recruitment & faster onboarding
- Faster and lesser training
- Information at our fingertips – Augmented reality, Smartwatches & headsets
- Translation software
- Robotics and autonomous vehicles
- Machine learning and AI
- Optimisation = less resources

But... These changes can be difficult for traditional employees and management to adopt
We must, and will, gradually adapt at all levels

- Command and control management
  - Enablers, technologist, collaborators and complex problem solvers

- Hands-on supervisors
  - Control centre operator, technicians & data scientists

- Manual workers
  - Digital savvy operators
    Proactive & informed hosts
A new challenge – the search for digital natives

- High cross industry demand for limited skills
- Ground handling perhaps not first choice
- Natural trend to embrace digital in daily lives – PDAs
- Embrace Digital
- Change recruitment and training approaches
- Learn new ways to manage millennials
- Partnerships
A new challenge – the search for digital natives

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Thank You!
EXCELLENCE IN AIRPORT PLANNING

Manuel Lanuza, Manager, Airport Development, IATA
Henrik Rothe, Senior Lecturer and Head of Urban Turbine Research Project, Cranfield University
Franciszek Ryczer, Director of Design and Engineering, Solidarity Transport Hub

MODERATOR: Martin Braun, Assistant Director, Airport Development, IATA
What is the ADRM?

Comprehensive airport design and development manual

Provides a framework of best practice planning guidance developed with industry

Can be applied universally to airports

Considers infrastructure impacts based on the latest industry trends
Global reach
ADRM applications

- Kuala Lumpur – LoS Assessment
- Hong Kong – Traffic forecast
- Bangkok – Master Plan and LoS best practice
- Athens – Traffic forecast and LoS best practice
- Latin American Concession Contracts
- Saint Petersburg – LoS Assessment
Rationale for the update

On a scale of 1-10, with 10 being extremely important, please rate the importance on the need to review and update the sections from the existing ADRM (10th Edition):

- Level of Service (LoS)
  - From 7 to 10
  - From 4 to 6
  - From 1 to 3

- Baggage Handling System
  - From 7 to 10
  - From 4 to 6
  - From 1 to 3

- Improved Capacity Calculations
  - From 7 to 10
  - From 4 to 6
  - From 1 to 3

- ORAT
  - From 7 to 10
  - From 4 to 6
  - From 1 to 3

From the following list of topics, on a scale of 1-10 with 10 being extremely useful, how useful would it be to have them included in the new 11th Edition?
Major changes - new 11th Edition

Level of Service Guidelines & Capacity Calculation Methodology

Airport Technology

Jet Fuel Infrastructure

Baggage Handling

Operational Readiness And Airport Transfer

Commercial Development

Other changes – Airside, International Cost Variations, Wayfinding, A-CDM
Industry effort – collaborative process
Level of Service

Updates to LoS Guidelines

Added Automatic Border Control facilities (outbound and inbound)

Maximum occupancy rate for gate Holdrooms removed and integrated
Capacity calculation methodology

Why update the methodology and formulas?

Major changes
Simple and consistent methodology
More flexible, robust and accurate
Removed correction factors
Focus on the relevant areas linked to LoS (number of units / space required for queueing)
Recommend starting the process by clearly understanding the demand of each sub-system
   - The use of Design Day Schedules and multiple peaks is fundamental
Capacity calculation methodology
Airport technology

Pace of change and development requires updates as regularly as possible

Major changes

Digital transformation
Airport IT trends
Passenger and baggage management technology elements
Airport operations management technology elements
Baggage handling systems

Updated and expanded section

Major changes

A framework for end-to-end baggage processes
Balancing resilience with capacity and performance
Selecting the right operating mode
Key insights on baggage screening, make-up and storage systems
Recognizes the growing importance of airport commercial activities

Key elements

Latest trends in airport commercial offerings
Developing a commercial strategy
Airport retail techniques to attract time-constrained passengers
The importance of food and beverage
Real estate and car parking
Jet fuel infrastructure

Fuel is often overlooked within airport masterplans or taken for granted

Key elements

Off-airport supply chain components and upstream market conditions

On-airport components, sizing and complexity

Safety and optimum design considerations

Cost estimates, economics and financial best practices
Operational Readiness & Airport Transfer

Why develop an ORAT section?

Key points include

Importance of dedicated governance

Definition of a detailed process

Stakeholder consultation

Focus on airport opening day
Other Changes

A number of other notable updates include

Airside infrastructure

International cost variations

Wayfinding

Airport Collaborative Decision Making
Summary

11th Edition release

Format options

ADRM Think Tank
Thank you
CENTRALNY PORT KOMUNIKACYJNY

SOLIDARITY TRANSPORT HUB

POLAND
AGENDA

1. STH context

2. What is our vision?

3. How we are going to achieve it?

4. Lessons Learned

5. Future Master Plan
Poland and Central and Eastern Europe market overview

THE FIRST CEE HUB

New transport hub for 180 million inhabitants of CEE.

A competitive logistic centre for the fastest growing economies in Europe.

In line with the objectives of the European Aviation Strategy.
Number of air passengers in Poland in the years 2004-2018
1st forecast for the coming years

In 2018, the number of passengers served by airports in Poland increased by 14.6%.

![Map of Poland with airport locations and passenger traffic data]

The share of Polish airports in passenger traffic in 2018 (%):
- Warsaw: 38.6%
- Cracow: 14.7%
- Gdansk: 10.9%
- Katowice: 10.5%
- Wroclaw: 7.5%
- Modlin: 6.7%
- Poznan: 5.4%
- Rzeszow: 1.7%
- Szczecin: 1.3%
- Others: 2.7%

Air traffic in Poland in 2028:
- 80 MLN

Forecast for 2028:
- 32 MLN
- 45 MLN

In the first year of CPK operation:
- Designed capacity for 10 years ahead.

Source: ULC, CPK, pasazer.com
Impact of CPK on economic growth

10% increase in aviation connectivity causes 0.5% country growth

10% increase in offering

1% GDP increase

1.7% import increase

3.3% export increase

4% tourism increase

10% increase in GDP

0.5% GDP increase

Example of growth based on increase in the UK civil air transport offering

Source: IATA

Source: PwC for UK Airports Commission
Impact of CPK on economic growth

THE TOTAL INCREASE IN BUDGET REVENUES THANKS TO CPK WILL BE PLN 2.4 BILLION ANNUALLY AND PLN 4.7 BILLION DUE TO THE INCREASE IN GDP

EVERY € 1 GENERATED BY THE AVIATION SECTOR GENERATES € 3 IN OTHER AREAS OF THE ECONOMY

source: Ministry of Infrastructure
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What kind of airport?
Solidarity Transport Hub Programme.

Airport definition

A multimodal transportation node, embracing the airport, rail and roads

A greenfield hub airport with:

- 2 RWYs (code F) with passive safeguarding up to 4 RWYs
- (80-90 a/c mvtns per h in 1st phase)
- **45 mppa** passengers terminal (design year 2037)
- transport interchange connecting air/rail/roads
- all supporting infrastructure
- One of the top 10 airports
STH Vision

Architecture

Technology

Service
Sense of Place

• expressing the character and culture of the region,
• unique and distinctive ‘sense of place’
People’s Airport

- Cherishing diversity
Personalized experience and universal design

- we aim to connect with you through technology,
Unique Experience

Creating a reasonable WOW factor
Operational Excellence

• Stakeholders and Passengers at the centre of our plans
Seamless Connectivity

- fully intermodal transport node – one point of contact
Flexibility

- we plan for resilient growth and change
- flexibility in processes and systems
Rooted in sustainability

• culture of social and environmental responsibility
Versatility

• open and equal approach to all key functions
AGENDA

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3. How we are going to achieve it?
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Functional elements are not everything – how we are going to get there?
Small steps – Big effect
Functional elements are not everything – how we are going to get there?

Mobilisation

- processes, procedures and approach,
- organisational structure with integrated consultants
- management paths and methodologies
- openness & transparency, collaboration & team work
- master programme of project delivery
- general budget of planning and programme delivery
- procurement strategy
Risk factors – challenging route to reach the goal
Realisation of these types of capital programs is always related to several types of risk

- risk identification
- evaluation
- risk management
- risk monitoring
- risk reporting
Functional elements are not everything – how we are going to get there?

Strategic Brief

A synthetic description of strategic requirements for each of the airport elements

Stakeholder Consultations

Surveys / Analysis / Environmental Reports

Mobilisation

Strategy Planning

Strategic Brief

Master Plan

Design

Delivery

Tests / Handover / ORAT

In Use

Land Acquisition
Strategic Brief
Terminal - Business Needs & Objectives

- **Airport**: cost efficient terminal
- **Passengers**: world class service & experience
- **Airlines**: efficient terminal operations
- **Commercial Tenants**: best possible space, technology & costs
- **Local Communities**: minimized noise & pollution
<table>
<thead>
<tr>
<th></th>
<th>Phase 1</th>
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<tr>
<td>Annual number of passengers</td>
<td>45 MPPA</td>
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<tr>
<td>Annual passenger ATM</td>
<td>400 000</td>
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<tr>
<td>Design peak hour Passengers</td>
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<td>Departing (passengers per hour)</td>
<td>9 500</td>
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<tr>
<td>Arriving (passengers per hour)</td>
<td>8 500</td>
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<td>Transfer (passengers per hour)</td>
<td>3 300</td>
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<tr>
<td>Design peak hour ATM</td>
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<td>IATA Level of Service</td>
<td>optimum to over-designed</td>
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<td>Level of pier service</td>
<td>95%</td>
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<tr>
<td>Minimum Connecting Time (MCT)</td>
<td>35-45 min (for domestic flights)</td>
</tr>
<tr>
<td></td>
<td>45-60 min (for international flights)</td>
</tr>
</tbody>
</table>
Strategic Brief

Terminal
General Features

2KM

code F

flexibility

$
Strategic Brief
Environment & Sustainability

LEED & BREEAM compliant

Environmentally-friendly and energy efficient
• adaptive and efficient HVAC system,
• maximum use of natural light,
• low emission power generation plants,
• use of renewable energy (e.g. geothermal, solar)

Maximised use of recycled and locally sourced materials

Water usage - Sustainable water management systems

Waste management – e.g. construction of wastewater treatment plant.

Integrated with landscape – featuring green indoor plants

“silent airport” approach and ICAO Balanced Approach to Aircraft Noise Management
Strategic Brief
Staff Requirements & Infrastructure

- employee-friendly environment
- employees’ best interests in mind & understanding of their needs
- aircrew office spaces and resting rooms
- sufficient office and social space
- attractive and convenient public transport options
- parking spaces in close proximity to the place of work
AGENDA

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Lessons Learned
Reference Infrastructural Programme workshops

Sharing experience and lessons learned on other capital programs including:

- Heathrow 3rd Runway Expansion Program
- New Istanbul Airport
- New Changhi Airport Masterplan
- New Beijing Airport
- HS2
- Crossrail
Conceptual design workshops

Design Workshops with leading Architectural Practices studies that became a source of inspiration during planning work at CPK

- Zaha Hadid Architects
- Foster+Partners
- Grimshaw
- Chapman Taylor
- Benoy
- Pascall+Watson
- Populous
- KPF
- Woods Bagot
Conceptual workshops

Foster + Partners
Conceptual workshops

Foster + Partners
Conceptual workshops
Conceptual workshops
Conceptual workshops

Zaha Hadid Architects
Conceptual workshops

Benoy
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Functional elements are not everything – how we are going to get there?

Master Plan

- central point to gather all required information regarding planned investment, including feasibility studies
- a key decision point
Functional elements are not everything – how we are going to get there?
Small steps – Big effect
THANK YOU
airports turning intermodal ...

taking a look ahead –
how airports synthesising with the urban centre.

Global Airport & Passenger Forum
Warsaw, October 2019
digitalisation
climate change
airports – quo vadis?
Urban Turbine Research Project – platform for multimodality
airports turning intermodal ... IATA GAPS, Henrik Rothe, 16 October 2019, slide 206
climate change

76.5% of people in Germany don’t believe government target can be met.
Greater London – Annual Mean NO2 concentration 2013
London Atmospheric Emissions Inventory (post 2013)
... new approach to reduce carbon emissions required
quo vadis?

- mega terminal
 quo vadis?

• functionality spread across the city
passengers

local residents

terraced terminal forecourt
multilevel apron

link gates to residences
Vantaa Aviapolis Helsinki Airport
tourists

Tourism has become a major driver of the urban economy, it’s also threatening the vitality of inner cities. In places like Prague, the exponential increase in tourists is creating significant capacity issues, as historic city centers are incapable of absorbing the sheer volume of visitors. Adding attractions for visitors to stay outside the center is one way to relieve pressure on the urban core, and to spread the economic benefits of tourism to the wider region.

designing airports following principles of a city is a first step.
Vienna airport
infrastructure can support social inclusion.

excessive levels of inequality can erode social cohesion, lead to political polarization, and ultimately lower economic growth.

IWF, 2017

Latin America: aerial ropeways connect remote communities to business hubs.

airports just begin to see their potential.
Urban Turbine Research Project – platform for multimodality

aviation has all the ingredients for innovation, yet the full potential has not yet been discovered and explored.

Urban Turbine is to propel new business opportunities for airports to reach out to a wider number of passengers and citizens alike.

• revisit the entire passenger processes from home to plane
• challenge the current model of the passenger terminal
• overcome peak model - better utilize infrastructure (365/24/7)
• engage with the local community, co-working, circular economy
• revisit baggage handling
• reduce empty journeys between airport and city
• wider choice of transport to airports - multimodality
Urban Turbine – research schedule

2019
airport | city | airport | airline | airport | surface access | airport

2020

2021

2022

the way airports, airlines and cities will interact

airport evolution
urban and suburban
people using airports
infrastructure in-between
overcoming the gap
shared space
circular economy
processing along the journey
intelligent mobility
integrated planning process
education and training

airports turning intermodal ... IATA GAPS, Henrik Rothe, 16 October 2019, slide 216
airport - city
airports integrated into the city

circular economy
Cranfield University has launched the world’s first Masters Course in Technology, Innovation and Management to accelerate the transition towards a Circular Economy in October 2017.

circular economy

this pioneering initiative integrates world-leading expertise from engineering, design, technology, environment and business to provide a unique and holistic approach to tackling significant global challenges and securing new economic value.
Electronic malls and showrooms: less space at airports – more sustainable merchandise distribution.

Multi-channel baggage collection and goods purchased electronically at airports require and generate new transport logistics.

Baggage collected as cargo travels outside peak hours freeing capacities for passengers at peak hours - better use of transport corridors.

Airport as multifunctional work space with inner city outlets - new business opportunities replacing car parking revenues.

Circular economy.
Flixbus with a potential to handle 100 million passengers p/a is currently talking to various airlines to create a new joint offering.

Sueddeutsche Zeitung, 13-Feb-2018

600m parking spaces in US cities today, 10% of urban land. With driverless cars demand for traditional parking will shrink. Flexible work/transport spaces can infill some of this space, providing more accessible working environs.

Norbert Barthle, MDB, Ministry of Transport and Digital Infrastructure, 2018

Cycling is being particularly promoted by the spread of digital technology. IT based services are making cycling more accessible.

Amazon oick-up, London

Concept: IDEO

Discounts for car renters contributing to more economical and ecological deliveries, offering pick up neighbours' groceries on their way home.

Private passenger drone service, Dubai

Detachable passenger cabin, Airbus patent

Tangential aerial ropeway service as multimodal airport access support

In planning: Geneva Airport

Peer-to-peer car rental

Car & Away, London Gatwick Airport, 2018

Flixbus with a potential to handle 100 million passengers p/a is currently talking to various airlines to create a new joint offering.

Sueddeutsche Zeitung, 13-Feb-2018

Utilise vertical external vehicle technology to serve building

Conception: WorkonWhells

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Discounts for car renters contributing to more economical and ecological deliveries, offering pick up neighbours' groceries on their way home.
urban turbine research project

the urban turbine investigates holistically the currently fragmented passengers’ journey from home to plane aiming for new strategies to turn airports into contemporary, passenger-centric and commercially sustainable business and entertainment spaces.

new technologies will transform passenger terminals from gate to people centred service centres interlinked to downtown-retail and real estate hubs. both airport and city will benefit from the hybrid condition.
Timeline:

- **May 2018**
  Kick-off workshop Cranfield

- **March 2019**
  Presentation to 20 CEO’s

- **November 2019**
  Funding workshop with participating airports in Cranfield
July 2019
Inauguration of DARTeC laboratories in Cranfield
Schiphol – integrated multi modality challenge: railway access constrained

Heathrow – outgrown capacity challenge: complete revamp of airport layout
Munich – wide-spread runways
opportunity: airport and non-aero can grow

Milton Keynes – Garden city
opportunity: grid structure densification
Daxing – one terminal concept challenge: high density building

Al Maktoum – airside multi-modality challenge: land take and airport access
status quo
multimodality
multi multimodality
the multimodal hub

• is not an airport – it’s a city
• is connecting transient to local communities
• interlinks high and slow speed, long and short distance travel
• disperses peak congestion
• propels circular economy
• reduces the environmental impact of travel
thank you for your attention.
happy to receive your questions, views and suggestions.
please feel free to contact me for T&C if you wish to participate in the Urban Turbine research.

Henrik Rothe  
Cranfield University  
Head of Urban Turbine  
h.rothe@cranfield.ac.uk  
+44 7930 328 990
DESIGNING AND DEVELOPING AN OPTIMAL AIRPORT

Graham Bolton, Global Practice Leader, Aviation – Mott MacDonald
Esben Kolind, Head of Operational and Business Analysis, Copenhagen Airport
Antionette Nassapoulos-Erikson, Senior Partner, Foster+Partners

MODERATOR: Allan Young, Head of Airport Development, IATA
Trends in Architectural Development and Design

A global review of developments in sustainable airport design

Antoinette Nassopoulos-Erickson – Senior Partner, Foster + Partners

anassos@fosterandpartners.com
The World is changing...
Change your attitude, not the climate.

Our planet, our future.

The time for voluntary action is over.

System change, not climate change.

It's getting hot in here, so take action.
The World has Understood

- **Students sue Trump administration**
- **IPCC 1.5°C report released**
- **Extinction rebellion formed**
- **Greta Thunberg begins school strike movement**
- **COP24 Katowice**
- **New York Green Deal**
- **UK Students strike**
The Paris Agreement
Nations Unies
Conférence sur les Changements Climatiques 2015
COP21/CMP11
Paris, France
• **technology** - to show that there are climate-friendly modern solutions, such as electromobility allowing for sustainable urban development, clean air and an opportunity for modern jobs;

• **human** - emphasizing the need to lead change together with people through the solidarity and fair transformation of regions and industrial sectors;

• **nature** - including multifunctional and sustainable forest management as part of climate neutrality and the role of forests as greenhouse gas sinks, and support for a synergic view of the three UN key conventions: on climate, on biodiversity and on desertification.
Paris Agreement target of 2.0°C is not enough. We need to limit global warming to 1.5°C.
Foreword

Cristina Gamboa, CEO, World Green Building Council

Buildings are responsible for 39% of global energy-related carbon emissions, with 38% coming from the "in-use" phase – to heat, power and cool them. If we can eliminate these emissions, buildings represent one of the greatest and most achievable ways to respond to the climate emergency facing us.

In May 2019, the World Green Building Council released a call to action report prompting business, government and NGOs to take urgent and coordinated action towards achieving 100% net zero carbon buildings by 2050. The response from industry in these two years has been inspiring, at a scale of action desperately needed to secure a below 1.5°C future.

Green Building Councils and partners across our global network have been developing industry capacity to deliver more net zero buildings. Faster. We are delighted to feature some of the leading industry action facilitating the transition within this, our inaugural Advancing Net Zero Status Report 2019. This includes signatures of WorldGBC’s Net Zero Carbon Buildings Commitment – an unprecedented statement of collective action towards decarbonization of the built environment. I look forward to seeing the early measurements of the current signatures echoed by many more organisations and governments over the coming years.

Whilst our focus has to date been on operational emissions and how buildings actually perform in use, in order to decarbonise our sector we must also tackle embodied emissions from the entire building lifecycle. The upcoming call to action report in September 2021 seeks to address this challenge.

Better buildings can be a huge part of the solution to improving our health, reducing global energy consumption, and eliminating reliance on fossil fuels. I invite you to be part of the solution: act for change, take climate action, and act now.

Chris Truitt, Partner, Head of Sustainability, Foster + Partners

We welcome the Advancing Net Zero Status Report 2019 by the World Green Building Council, as they help to shape our built environment to be low carbon, economically future-proofed and socially just. A holistic approach to building decarbonisation is essential for a just transition to take building emissions to net zero and avoid dangerous levels of climate change. We plan, through our projects and our own efforts in-house, to lead this transition, and hope you will join us.
Buildings account for 39% of global carbon related energy emissions. 28% in use heating power cooling.
Aviation contributes 2% of Global CO2 emissions and causes about 5% of human global warming climate impact.

Aviation is projected to consume approx. ¼ of worlds remaining carbon budget by 2050 for 1.5°C.
the most significant environmental impact factors occurring from energy usage are the CO2 emissions arising from both the air side and land side operation
In Practise
IATA aims for 50% reduction in Net CO2

An average improvement in fuel efficiency of 1.5% per year from 2009 to 2020
A cap on net aviation CO2 emissions from 2020 (carbon-neutral growth)
A reduction in net aviation CO2 emissions of 50% by 2050, relative to 2005 levels

• Improved technology, including the deployment of sustainable low-carbon fuels
• More efficient aircraft operations
• Infrastructure improvements, including modernized air traffic management systems
• A single global market-based measure, to fill the remaining emissions gap
ACI Europe targets 100 airports by 2030 to be carbon neutral.

There are now 259 accredited airports worldwide.

259 accredited airports worldwide.
ACI / ACA Accreditation Carbon neutral

There are now 259 accredited airports worldwide.

48 achieved carbon neutral status
Carbon Accreditation initiatives

- Athens
- Copenhagen
- Gatwick
- Lyon
- Nice
- Oslo
- Dallas
- San Diego
- San Francisco

User Behaviour

- Zero untreated waste to landfill
- Limits on staff travel by air
- Facility management
- Public transport connections
- Orientation
- Material choices
- Planning

Passive Design

- 100% renewable energy
- Cooling terminals with groundwater
- LED lights
- Smart terminals
- Electric vehicles

Systems

- Solar cells
- Bio fuels
- 100% Green electricity

Renewable Energy

Carbon Offsetting

Carbon neutral
CO2 neutral by 2050
Performance Roadmap

Big Reductions

User Behaviour

Passive Design

Systems

Renewable Energy

Small Reductions
Connectivity to clean transport
ACI / ACA Accreditation

- 1st airport in the Middle East to earn the third level of Airport Carbon Accreditation
- Carbon Neutral

2019 plans
- solar farm – 30% of airport consumption
- LED’s apron lighting
Foster + Partners Kuwait International Airport, 2010- under construction -13 MPPA
Sustainable design minimising taxi-ing and idling

Sustainable surface water management

Native Planting minimising irrigation

Sustainable Parking covered provision for alternative fuels

Access to mass transport systems

Foster + Partners Kuwait International Airport, 2010- under construction -13 MPPA
Foster + Partners Kuwait International Airport, 2010- under construction -13 MPPA
Kuwait Airport

Viability of rainwater harvesting to be considered - stormwater management plan to be put in place.

Recovered water from the blackwater treatment process, used to supply cooling towers.

Any water not used or reused onsite will be discharged to local drainage network at an agreed rate.

Blackwater collection onsite. Minimises impact on existing infrastructure.

Advanced metering and monitoring strategy to be carried out.

Non-potable recycled water used for any irrigation top-up.

Greywater + condensate recovery provides additional supply of non-potable water.
Foster + Partners Kuwait International Airport, 2010- under construction -13 MPPA
70% freshwater use reduction

50% of materials sourced locally

50% carbon reduction

40MW of solar energy production

75% construction waste reduction

LEED Platinum v4
Separate submissions for each building within the LEED Campus:

- 40 MW Solar Array
- Air Traffic Control Tower
- Passenger Terminal Building
- Ground Transportation Center
- Area Control Center

Sustainable Measures:

- Brownfield restoration
- Quality enhancement of water bodies
- Rescue and relocation of biodiversity
- Management of bird population
- Heat island effect mitigation
- Native landscape approach
- Waste water treatment
Sustainable water strategy

**WATER USE** in terminal
- Freshwater 2000 m³ per day
- Recycled water 2000 m³ per day
- Harvested rainwater 1000 m³ per day

Central **WATER TREATMENT**
- 6000 m³ per day
- Of which 4000 m³ per day is discharged for city use

3 Olympic pools
of water moving around the site each day
Onsite renewable energy

200,000sqm array

40 mega watts

at no purchase cost to the client

= 35% offset
Energy initiatives

- Central Utility Plant with waterside economizers
- Double foundation slab for ventilation and free cooling
- High efficiency mechanical ventilation
Energy initiatives

- Daylight allowance
- LED high efficiency lighting
- High performance envelope
Foster + Partners - Mexico City’s New International Airport (NAICM) 2014
Current Building Standards are too low!

How to bridge the gap?
Methodologies
Aéroport Marseille Provence
**Aeroport Marseille Provence: Our Approach to Sustainability**

**National Context**

- **Foster + Partners**
  - F+P published guidance on the Paris Agreement at COP22

- **Government of France’s Climate Plan**
  - The E+C- label: Implementing an environmental regulation in 2020 for low carbon buildings
  - Accredited third-parties certifications
Aeroport Marseille Provence: Terminal Sustainability Strategies

1. Efficient Use of Site Area
2. Structural Optimisation
3. Low Carbon Materials
4. Energy Efficiency + Renewables
5. ACA Lv 3+ Neutrality by 2022
Aeroport Marseille Provence: Terminal Sustainability Strategies
Aeroport Marseille Provence: Carbon analysis

Baseline Carbon

Optimised Carbon

OPTIMISATION:

909.2 kgCO₂/m²

631.0 kgCO₂/m²

Toiture et Puits de Lumière 20%

Sous-Structure 28%

Façade 11%

Sols 7%

Inoccupé 5%

Plafond 1%

IWS 3%

Toiture et Skylights 20%

Sous-Structure 30%

Façade 9%

Sols 10%

Inoccupé 2%

Plafond 2%

IWS 2%

VT, Autrui 2%
Aeroport Marseille Provence: Passive Design

- Solar protection
- Highly thermal insulated envelope and sizing of technical systems
- Natural ventilation of the Coeur terminal
- Life Cycle Analysis
- Implementation of regulatory thermal calculation RT2012 (*calcul thermique règlementaire RT2012*)
Aeroport Marseille Provence: Energy and Systems

- Ventilation by high energy efficiency
- Airport heating network connection
- Low pollution construction site
- Low carbon materials
- High efficiency water heater
- LED lighting and natural lighting
- Insulated distribution network
- High efficiency hydraulic networks
High performance special photovoltaic tile approved by the aviation regulators on the roof of the Coeur building

+ opportunity to use PV cells on the parking area
Monitor embodied energy not just operational energy

Develop methodologies to meet target Net –zero carbon emissions measured over entire lifecycle

Reduce total omission by 2050 or even by 2025
DO MORE WITH LESS

MANAGE CARBON CREATION
EMBODIED ENERGY
RENEWABLE ENERGY

WATER CONSERVATION
RE-USE + RECYCLE
PASSIVE DESIGN
How to build an optimum airport

Practical considerations for planning and development
Optimal: a condition, degree, amount or compromise that produces the best possible result.
### Optimum

A balance informed by vision and priorities

<table>
<thead>
<tr>
<th>VISION</th>
<th>To give passengers the best airport service in the world</th>
</tr>
</thead>
<tbody>
<tr>
<td>PURPOSE</td>
<td>Making every journey better</td>
</tr>
</tbody>
</table>

#### Priorities
- MOJO
- And outstanding customer service
- Beat the plan
- Sustainable growth

#### Values
- Keeping everyone safe
- Treating everyone with respect
- Giving excellent service
- Working together
- Improving every day
- Doing the right thing

Heathrow Airport Strategic Brief
Possible lenses on ‘optimal’
More than just passenger service

**Sustainable**
Respecting environment and local communities

**Affordable**
Meeting needs of investors and customers

**Usable**
Responding to needs of airport community

**Deliverable**
Safely deliverable to cost & time
Optimal Planning

“surely I just apply ADRM v 11?”
Planning in practice

1. Demand basis
2. Operating concept
3. How optimal
4. Beyond ADRM
Optimum planning

Demand

ADRM suggests different options for definition of planning demand based on traffic forecasts

• answer not the same for all airports
• likely to need different design days for different processes / segments
• understand the consequences of decision on LoS and operations at peak
• look at system level view as well as by processor
Optimum Planning

Operational concept

‘Operational concept’ plays a central role in planning – but often only implicitly.

Encompasses factors such as:

• Airfield operations
• Airline assignments
• Common use strategy
• Call to gate strategy
• Passenger product
• PRM strategy
• Technology adoption
Optimum planning

How ‘optimum’

Applying ADRM in practice:

“do I have to design all processes to ‘optimum’”

‘where in the optimum range should I position’

Based on understanding of:

• passenger sensitivity to LoS in specific circumstances

• wider system impact of decision

• alignment with phasing strategy
Optimum planning

Beyond ADRM

Analytical approach gives good basis for sizing core processors

Also gives a target for areas such as circulation spaces – but these are generally dependent on building geometry.

Other terminal areas need to be worked through based on operational and commercial concepts, stakeholder requirements and building geometry, such as:

- retail
- logistics areas
- toilets
- staff accommodation
Optimal Design
Optimum design

Integration

1. Disciplines
2. Components
3. Systems
4. Operations
Optimum design

Agile

“Just because it can be analysed doesn’t mean it should be”

Is there scope to apply an agile approach?

• prioritise ‘requirements’
• sprints: cross team
• minimum viable product
• fail fast / pivot

What level of detail is really needed – and why?
Optimal design

Sustainable
Optimum design

Digital : from BIM to Twin
Optimum delivery

“why does this matter for a planning symposium?”
Relevance of delivery strategy

1. Phasing strategy
2. Level of information
3. Innovation
4. Supply chain capacity & capability
## Optimum delivery

### Spectrum of models

<table>
<thead>
<tr>
<th></th>
<th>Model Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Engineer, Procure, Construct (EPC)</td>
</tr>
<tr>
<td>2</td>
<td>Traditional</td>
</tr>
<tr>
<td>3</td>
<td>Construction Manage</td>
</tr>
<tr>
<td>4</td>
<td>Early Contractor Involvement (ECI)</td>
</tr>
<tr>
<td>5</td>
<td>Alliance</td>
</tr>
</tbody>
</table>
Optimum delivery

Emerging thinking - enterprise model

Understanding how supply chain can be aligned with wider programme objectives

Recognise that lowest tender price not necessary lowest out-turn capital cost or return for business

Potentially rebalances risk

Seen in context of wider change in delivery model
Optimum delivery

ORAT

Implementing CORE PROCESSES of Airport’s Operation:

- Scenarios
- Final Reporting
- Evaluation
- Final Reporting
- AOD

Commercial and Operations

ORAT Process Timing

- Start
- Planning
  - Schedule
  - Phasing
  - Interfaces
- Readiness
  - Readiness Management
  - Testing & Commissioning
- Operational Availability
- Activation
  - Certification
  - Trials
- Transition
  - Move Management
  - Opening Day
- Launch
  - Post-Opening Day
A golden thread

Clarity of priorities

Considered approach

Alignment of the enterprise
Thanks
graham.bolton@mottmac.com
Optimising the check-in process

Esben Kolind
Head of Operational & Business Analysis
IATA Global Airport & Passenger Symposium, Warsaw
Pathway 2 – The Transforming Airport: Designing and Developing an Optimal Airport, October 16th 2019
Agenda

- CPH Context
- Check-in Optimisation Programme
- New technology for check-in process
- Follow-up on counter utilization
CPH Check-in Context

➔ 30.3 MPPA in 2018
➔ 110 check-in counters
  ➔ 58 SSBD hybrid counters – 20 airlines
➔ 46% travel with hand luggage only
➔ 55% online check-in (pre-airport arrival)
➔ 95% international traffic
➔ 41 long haul routes
➔ 67% leisure traffic
➔ Major airlines
  ➔ SAS 34%
  ➔ Norwegian 19%
  ➔ Ryanair 6%
  ➔ EasyJet 5%
CPH Check-in Optimisation Programme

➔ Ongoing initiatives 2016-2019
➔ Purpose: Increase utilization of existing counters
  ➔ No new counters until 2021
➔ Focus on allocation, process improvements, self-service, common-use and new technology
➔ Goal: Reduce demand by 23 counters
Guidelines for check-in optimisation

➔ Counters are for bags!
➔ No bag to check-in? No need to be in the area
➔ Reduce time spent in front of counter
➔ Fast and easy process for 90% of passengers
➔ Same 2-step SSBD infrastructure for all airlines
➔ Vision: One common bag drop for all passengers
Mobile CUSS

➔ 23 mobile CUSS kiosks installed in 2018
➔ 10 hour battery life
➔ Improves flexibility in check-in allocation

➔ Increase kiosk capacity temporarily as needed in specific areas
  ➔ Events, group check-in, cruise operation

➔ **Goal:** Reduce dwell time in check-in area and at check-in counters
Mobile check-in counters

➔ 10 battery powered and Wi-Fi enabled mobile check-in counters in operation since 2018
➔ Functions as a regular check-in counter, except baggage belt and scale
➔ Flexible allocation according to demand
➔ Developed for CPH work requirements in collaboration with Marcus Pedersen
➔ Used in conjunction with SSBD for all special processes
   ➔ Odd-size, overweight, booking changes etc.
➔ **Goals:**
   ➔ Reduce demand for regular counters and SSBD counters
   ➔ Reduce process time and waiting time at SSBD
Self-service bag tag printer


- Boarding card scanned → tag printed

- Average process time: 10 seconds

- Can be used in conjunction with both manual bag drop and SSBD

Goals:

- Reduce demand for full CUSS kiosks
- Reduce dwell time in check-in area
- Improve passenger experience
Example – SSBD for LCC

Mobile check-in counter 2-step hybrid SSBD counter 5 LCC airlines in same SSBD area
Follow-up

► Waiting Time measurement system (Xovis)
  ► Waiting times, process times, queue lengths, passenger appearance profiles

► Actual counter utilization
  ► Was the counter allocated?
  ► Was it open?
  ► Any bags inducted?
  ► $2 \times 2 \times 2 = 8$ different counter states
Potential reduction?

Insufficient allocation?

Unused?

Open later?
Questions?