AUGUST 6, 2020

IMPACT ASSESSMENT OF COVID-19 MEASURES ON AIRPORT OPERATIONS & CAPACITY

WEBINAR

UTA KOHSE, MANAGING PARTNER
MARC ILLING, SENIOR CONSULTANT
INTRODUCTION

COVID-19 IMPACT ANALYSIS ON AIRPORT CAPACITY
COVID-19 MEANS SEVERAL NEW CHALLENGES

› One major aspect: **possibility to keep physical distance**
› Therefore airports need to know the **passenger volumes and capacities** of each area in order to:

  - Expand Queuing Areas
  - Realign Staffing / Allocation
  - Elaborate Concept for local Health Authorities
  - Know about Saturation Capacity
  - Prepare for Ad-hoc changes

CHALLENGES

› Uncertainty and very dynamic changes
› But **laissez-faire / trial and error** in real life can **jeopardy health**
› ️ Worst case: uncontrolled congestion ️ bad reputation

**Systematic Assessment required ️ Use Simulation for “What-if”**
CHARACTERISTICS OF STUDY
› Quantify capacity impact of Covid-19 measures on airport operations and capacity
› Consider a wide spectrum of situations

METHODOLOGY FOR OPTIMIZATION
› Understand influencing parameters
› “What-if” to develop ‘best practices’ ➔ smooth recovery and guidelines

Area of Conflicts for Covid-19 Measures

- Effectiveness for Health Safety
  The objective is to effectively reduce infection risks

- Passenger Confidence in Safety
  The objective is to increase the passengers’ wellbeing even with non-proven measures

- High amount of permitted Travelers
  The objective is to not limit the number of travelers

- Required Safety Level?

- Reduction of Financial Impact
  The objective is to decide for cost-efficient solutions

- Ensuring Handling Capacity
  The objective is to minimize impact on throughput capacity

This Webinar: Share general findings and approach
Applied by Airports: Specific saturation capacity

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OVERVIEW | CATEGORIES OF IMPACT / MEASURES

Reduction of Health Risk by...

... more stringent Processes
- Additional Processes
  - Temperature Check, Covid-19 Test ?, Health Certificate Check ? ...

... keeping Distance
- Social Distancing in Queues and Holding Areas
  - Enlargement of Queuing and/or faster Throughput

- Increased Processing Time
  - Additional Questions at Check-In / Immigration, ...

- Limited Availability of Processors
  - Use of every 2nd Counter/Lane / Reclaim Belt / Gate Holdroom only...

- Changed Passenger Flow
  - Suspension of simplified Transfer Flows, Other Allocation...

- Delayed Boarding / Deboarding
  - Boarding by Zones, Delayed Deboarding, Head Start for Luggage...

Question: What is the impact on airport capacity?
TWO TRENDS
› Recovering traffic numbers
› Alleviating health safety measures
   › stepwise
   › but likely certain measures will stay
WHAT DOES THIS MEAN FOR CAPACITY?
› Will health safety measures end soon enough when traffic gets closer to Pre-Covid volumes?
› If not, airport will face a New Saturation Capacity.
General findings: saturation capacity: 60-75%

Actual saturation capacity is airport specific | Consideration of layout and local situation

**OVERVIEW | NEW SATURATION CAPACITY**

- **Fix - Capacity Lost:**
  Very likely that Covid-19 measures reduce capacity with hardly any chance for solving with reasonable time / effort

- **Flexible - Capacity at Risk:**
  Reduction very much depending on layout / process specifics;
  Solving generally possible but costly

- **Capacity Remaining:**
  Either with 'do-nothing' or easy measures sustainable capacity

* Relates to NonSchengen Traffic only
DETAILED RESULTS PER TERMINAL AREA

COVID-19 ANALYSIS ON AIRPORT CAPACITY
TESTING IS GETTING MORE IMPORTANT – HEALTH CHECKS AT AIRPORT – BUT...

Temperature screening?
→ Does not detect persons

Fast antibody tests?
→ not accurate

Reliable PCR Test?
→ takes too long, costly

Health Certificate / Health Passport?
→ no standard yet

→ VERY DYNAMIC SITUATION
HEALTH CHECK | SCENARIO: COVID TEST ON ARRIVAL
LOCATION OF TEST UNIT - PRE- OR POST IMMIGRATION?

- Immigration control “flattens” the demand → in example: **30% less test units**
- No unnecessary immigration for Schengen from Risk Areas

<table>
<thead>
<tr>
<th>Scenario</th>
<th>desired Waiting Time</th>
<th>Number of Test Booths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Pre-Immigration</td>
<td>15 min</td>
<td>32</td>
</tr>
<tr>
<td>Test Post-Immigration</td>
<td></td>
<td>23</td>
</tr>
</tbody>
</table>
CHECK-IN

COVID-19 IMPACT ANALYSIS
COVID 19 IMPACT
› Social Distance in queues
› Mandatory health questions at check-in
› More passengers check-in bags
› Earlier show-up

MITIGATION MEASURES
› Include health questions in online check-in
› Adjust opening times for 2 of 4 counters
**Scenario Pre-Covid:**
Capacity adequate to demand
Short queues

**Worst Case / Do Nothing:**
- Social distance
- Early arrival of pax
- More bags checked-in
- Health questions to all pax

**Optimization Potential:**
- allowing online check-in again
- asking health questions online
- adapt check-in opening
**Scenario Pre-Covid:**
Longer waiting time already in baseline
Queue space used to full extent

**Worst Case / Do Nothing:**
- Social distance
- More early arrival of pax
- More bags checked-in
- Health questions to all pax

**Optimization Potential:**
- Earlier opening
- Queues still problematic
- Overflow area needed

- Pre-Covid: 40 Pax | 60m²
- Worst Case: 100 Pax | 200m²
- After Optimization: 60 Pax | 120m²
CHECK-IN | SPACE PROVISION FOR LONG QUEUES

KEEPING COUNTERS FREE TO ASSIGN MORE SPACE

Manned Counters = 4
But Queue Space of 6-7 Counters
ALLOCATION OF REDUCED FLIGHT SCHEDULE

**50% Reduction:**
Allocation possible without using main carriers’ rows

**75% Reduction:**
Allocation not possible without using main carriers’ rows
Could be done when breaking with historic allocation rules
### Physical distance impact

**Space | Time | Throughput**

**Queue space**
- 25% Queue capacity drop

### Earlier passenger show-up

**Space | Time | Throughput**

**Shifted demand time**
- Up to 2-3x queue and wait time, if no adjustment

### Additional health question/self declaration

**Space | Time | Throughput**

**Check-in process**
- Up to 50% reduced throughput (incl. mandatory agent check-in for everybody)

---

### Mitigation

1. Enlarge queue space
2. Leave gaps in allocation
3. Increase staff level to reduce queues

---

### Mitigation

1. Adjust opening time
2. Do not encourage pax to show up early
3. Motivate pax for self-check-in

---

### Mitigation

1. Pre-flight declaration online
2. Health declaration as separate process (e.g. via kiosk)
SECURITY CONTROL

COVID-19 SCENARIO SIMULATIONS
DIFFERENT RECOMMENDATIONS AND GUIDELINES

Physical Distance 1.5m
→ Space-Demand 2.00 m²
SECURITY CHECKPOINT | ANALYSIS OF LAYOUT (SPACE)

Pre Covid-19

Post Covid-19
(1.5m social distance)

450 PAX in Queue  |  Waiting Time: 10 min
→ Queue systems sufficient

450 PAX in Queue  |  Waiting Time: 10 min
→ Queue systems not sufficient
SECURITY CONTROL | IMPACT ON THROUGHPUT

Impact on Space
- Less drop off positions due to physical distancing
- More pax drop additional items after alarm at WTDM
- Requirement to take off shoes (esp. if body scanner is in use)
- More instructions from staff for self-packing trays

Impact on Demand
- Reduced waiting space at WTMD / Body Scanner
- Repeated scans of pax preferred to manual search
- Pat search takes longer due to more instructions and hygiene rules
- More liquids in bags due to hand sanitizers/sprays

Impact on Processing Time
- More repeated X-ray scans to avoid manual inspection
- More trays to be checked (e.g. shoes are checked as Covid-19 measure)
- Manual Bag search takes longer due to more instructions and hygiene rules
<table>
<thead>
<tr>
<th>Before COVID-19</th>
<th>During COVID-19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Throughput (1 Lane): 170 Pax/h</td>
<td>Throughput (1 Lane): 88 Pax/h</td>
</tr>
<tr>
<td>- Front Section: 5 Pax</td>
<td>- Front Section: 3 Pax</td>
</tr>
<tr>
<td>- Rear Section: 13 Pax</td>
<td>- Rear Section: 6 Pax</td>
</tr>
</tbody>
</table>

**Video-Link:** [https://youtu.be/KXLt5ys0r3A](https://youtu.be/KXLt5ys0r3A)
<table>
<thead>
<tr>
<th>Scenario</th>
<th>Throughput</th>
<th>Throughput Reduction</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>185 PAX/h</td>
<td>-0%</td>
<td>-</td>
</tr>
<tr>
<td>Increased Divesting Time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COVID-19</td>
<td>160 PAX/h</td>
<td>-15%</td>
<td>More instructions, stowage of loose items lead to increase</td>
</tr>
<tr>
<td>1 Drop off position</td>
<td>90 PAX/h</td>
<td>-50%</td>
<td>Major capacity drop</td>
</tr>
<tr>
<td>Limited Number of Pax in pickup zone</td>
<td>155 PAX/h</td>
<td>-15%</td>
<td>Higher impact expected with more performant lanes</td>
</tr>
<tr>
<td>Drop more items beforehand</td>
<td>125 PAX/h</td>
<td>-30%</td>
<td>Reduction strongly depends on trays and divesting time increase</td>
</tr>
<tr>
<td>Repeated pax scans with dropping additional items</td>
<td>150 PAX/h</td>
<td>-20%</td>
<td>Impact assumed to be higher if body scanners in use</td>
</tr>
<tr>
<td>Repeated X-Ray scans of trays</td>
<td>155 PAX/h</td>
<td>-15%</td>
<td>Low impact on sample security setup</td>
</tr>
</tbody>
</table>
2 Divest Positions, shared WTMD

- Reducing drop off positions (2 → 1)
- Dropping more items (belt, shoes) to reduce pat down search

3 Divest Positions, dedicated WTMD

- Reducing Drop off positions
- Repeated X-Ray tray scans
- Dropping more items to reduce pat down search
- Longer manual checks

2 Divest positions, shared Body Scanner

- Reducing drop off positions (2 → 1)
- Repeated pax scans at body scanner to avoid pat down search

3 Divest Positions, dedicated Body Scanners

- Reducing Drop off positions
- Repeated X-Ray tray scans
- Longer manual checks
Baseline Situation (Pre-COVID)

- Traffic Volume: **100%**
- Security Throughput: **180 PAX/h (100%)**
- Open Lanes: **100%**
- Regular Social Distance: **1m² / PAX**
- Waiting Time: **10 min**
- Queue Space: **sufficient**

Open Lanes - 15
Closed Lanes
COVID Situation „Do Nothing“ with 50% Traffic

Traffic Volume: 50%

Security Throughput: 135 PAX/h (75%)

Open Lanes: 50%

Increased Social Distance: 2m² / PAX

Waiting Time: 45 min

Pax in Queue: 750 Pax
COVID Situation „Optimized“ with 50% Traffic

Traffic Volume: 50%  Open Lanes: 70%

Reduced Throughput: 135 PAX/h (75%)  Increased Social Distance: 2m² / PAX

→ Update of Staffing factor required

<table>
<thead>
<tr>
<th>Additional Staff Requirement (compared to Pre-Covid)</th>
<th>Traffic Volume compared to Pre-Covid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic</td>
<td>50%</td>
</tr>
<tr>
<td>35% 60 PAX/h</td>
<td>x3</td>
</tr>
<tr>
<td>50% 90 PAX/h</td>
<td>x2</td>
</tr>
<tr>
<td>65% 117 PAX/h</td>
<td>x1.6</td>
</tr>
<tr>
<td>75% 135 PAX/h</td>
<td>x1.4</td>
</tr>
<tr>
<td>100% 160 PAX/h</td>
<td>x1</td>
</tr>
</tbody>
</table>

Open Lanes - 10
Closed Lanes
### SECURITY | IMPACT AND MITIGATION

#### QUEUE SPACE
- **Space** | Time | Throughput

- **50% capacity drop**

  1. Enlarge queue space
  2. Increase staffing level to reduce queues
  3. Active crowd management

#### THROUGHPUT REDUCTION
- **Space** | Time | Throughput

- **25 to 50%**

  1. Apply other measures with same health safety (e.g. masks, plexiglass)
  2. Optimize staffing rules (more staff per given pax volume)

#### SHIFTED DEMAND TIME / NUMBERS
- **Space** | Time | Throughput

- **Unpredictability**

  1. Demand driven staffing (ad-hoc adjustments)
  2. Contingency factor
BOARDING GATE ROOMS

COVID-19 IMPACT ANALYSIS
Pre-Covid: suitable space provision

Post-Covid: Physical distancing:
- Gate capacity reduced to 50-75%
- Heavy overflow into other areas

Optimization: Allocation should leave gaps

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ALLOCATION

- Pre-Covid, 3 flights allocated to gate area without constraints
- Post-Covid, 2 factors accumulate and cause problems:
  - **Reduced capacity** due to physical distancing
  - **Earlier show-up**, e.g. because of anticipated longer waiting times, which actually do not occur
- **Mitigation**: Move one flight (to other gate or changed STD)
EXAMPLE: PHYSICAL DISTANCING IN BUS GATE

Pre-Covid:
- „100%“ traffic
- Regular IATA level of service

Post-Covid:
- 75% traffic (Saturation)
- Physical Distance
<table>
<thead>
<tr>
<th>Gate Layout</th>
<th>Covid-19 Impact</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Open gate concept</strong></td>
<td>Low</td>
<td>Allocation of every other gate, as long as possible.</td>
</tr>
<tr>
<td>adjacent gates in line of sight</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Generally open gate concept</strong></td>
<td>Medium</td>
<td>Avoidance of simultaneous allocation in same zone as long as possible. Improved passenger information.</td>
</tr>
<tr>
<td>but gates not in line of sight</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Closed gate concept</strong></td>
<td>High</td>
<td>Avoid closed gates when not necessary.</td>
</tr>
<tr>
<td>access for allocated flight only</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dual gate concept</strong></td>
<td>Low – Medium</td>
<td>Alternating allocation of Schengen and NonSchengen flights.</td>
</tr>
<tr>
<td>with Schengen and Non-Schengen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>gates at different levels serving one stand</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Main central dwell area</strong></td>
<td>Low – Medium</td>
<td>Early announcement of actual gate to distribute passengers.</td>
</tr>
<tr>
<td>late announcement of actual gate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
AIRCRAFT TURNAROUND AND DE/BOARDING

COVID-19 IMPACT ANALYSIS
BASELINE – PRE-COVID

- Example: Typical European flight, hybrid carrier, narrow body aircraft
- Main focus of critical path is within aircraft cabin
AIRCRAFT TURNAROUND | BOARDING VIDEO

POTENTIAL BOARDING ISSUES

› Health check, additional travel document check
  → lower throughput rate

› Back-to-front boarding
  → less person contacts
  → less chances of taking a seat simultaneously

› Social distance in cabin
  → increased time for storing hand luggage

Based on LF, luggage boarding principle the increase differs.
As a conservative approach 10 min increase could happen.

Video-Link: https://youtu.be/V1sGkoymmj4
POTENTIAL DEBOARDING DELAY

- Passengers stay seated longer to keep social distance.
- But no general change in deboarding principle.

Deboarding process might be prolonged around 0 to 3 minutes.

Video-Link: https://youtu.be/-yJs0Y_SltA
AIRCRAFT TURNAROUND | IMPACT OF COVID-19

- Typical European flight, hybrid carrier, narrow body aircraft
- **Example:** aircraft turnaround **increases by around 15 minutes** *(from 40 to 55 minutes)*
- Baggage loading/unloading can be longer as long as hand luggage is restricted.

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Only a limited number affected by increased turn around (e.g. 50-75% of turnarounds > 50 min anyway)

Longer stand occupancy time observed in reality has other additional reasons, e.g.

- Less flights per aircraft per day
- Early arrival due to empty airspace

Data Source: Analysis of past schedules of a major European hub
CPCITY OF BUS

› Strict physical distancing: just 25 pax/bus
  150 pax: 6 busses instead of 2!
› Operationally unfeasible - trade-off: e.g. 50 pax/bus

BUS REQUIREMENTS

› + 50% more buses for same traffic
› → unlikely that airports invest now

SATURATION CAPACITY

› 70% of bus gate flights still manageable with existing buses
BOARDING GATES | IMPACT AND MITIGATION

**HOLDING CAPACITY**
- 25 to 50% drop

**Mitigation**
1. Optimize allocation
2. Actively assign dwell area (time of gate announcement, limited inflow etc.)
3. Change / reject flights

**BOARDING TIME**
- + up to 50% increase (for back-to-front boarding)

**Mitigation**
1. Avoid short turnarounds
2. Prefer contact stands
3. Limit cabin luggage
4. Inform passengers about boarding principle

**BOARDING TIME**
- depending on complexity of flight / process

**Mitigation**
1. Do checks at check-in already / while pax wait in the gate
2. Increase manpower

---

1. Optimize allocation
2. Actively assign dwell area (time of gate announcement, limited inflow etc.)
3. Change / reject flights

1. Avoid short turnarounds
2. Prefer contact stands
3. Limit cabin luggage
4. Inform passengers about boarding principle

---

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IMMIGRATION

COVID-19 IMPACT ANALYSIS
MANDATORY IMMIGRATION AT AGENT - NO SELF-SERVICE

- Physical distance in queues requires more space
- Any manual checks (health certificate / questions) not possible e-gates.
- Thus, all passengers need to use manned counters.

→ Saturation capacity of **50-75%** of NonSchengen flights

![Pre-Covid](image1)
- 250 Pax
  - (→ fit in Queue)
  - **10 min** Waiting Time

![Post-Covid](image2)
- 550 Pax
  - (→ Overflow in Corridors)
  - **40 min** Waiting Time
IMMIGRATION | IMPACT AND MITIGATION

**Physical Distance Impact**
- 50% Queue capacity drop
- Space | Time | Throughput

**Additional Health Question/Self Declaration**
- 10-30% capacity drop, (even more if no use of e-gates anymore)
- Space | Time | Throughput

**New Process: Mandatory Covid-Test**
- Need for additional space, equipment, staff
- Delayed bag pick-up
- Space | Time | Throughput

**Queue Space**
- 50% Queue capacity drop

**Immigration Process**
- 1. Enlarge Queue Space
- 2. Increase Staffing Level to reduce queues
- 3. Control inflow of pax (e.g. delayed deboarding)

**Mitigation**
- 1. Pre-flight registration online organized by government (e.g. QR code)
- 2. Check before Immigration as separate process
- Space | Time | Throughput

**Mitigation**
- 1. Pre-flight registration online for fast track
- Delayed bag pick-up
- Space | Time | Throughput

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BAGGAGE RECLAIM

COVID-19 IMPACT ANALYSIS
Enlargement of required waiting space around belts for the same passenger number.

Waiting areas overlap for simultaneous allocations at neighboring belts.
GOOD PRACTICE

› If traffic allows, allocate **large belts to narrow body** flights.
› **Leave gaps** between simultaneous arrivals.
› Let **groups** use overflow areas; **only one selected person** shall pick-up **at the belt**.
PASSENGER SHOW-UP VS BAGGAGE DELIVERY

- Inside the baggage hall, pickup shall be 'come and go'
- Flights might be delayed, if baggage hall gets overcrowded.

Post-Covid: Optimized Arrival Flow of Passengers and Bags
**BAGGAGE RECLAIM | IMPACT AND MITIGATION**

**QUEUE CAPACITY**
-25% drop

**Mitigation**
1. Leave gaps in allocation
2. Assign secondary waiting areas
3. Delay deboarding for head start for luggage

**HIGHER DEMAND IN RECLAIM CAPACITY**
(more passengers at belt and longer belt occupancy)

**Mitigation**
1. Consider in belt allocation
2. Speed-up baggage delivery

**IMBALANCED PAX AND BAGGAGE FLOW**
(exceeded belt capacity, longer belt occupancy)

**Mitigation**
1. Consider in belt allocation
2. Let floorwalkers pick-up and organize luggage

---

**Physical distance**
Space | Time | Throughput

**More checked luggage**
Space | Time | Throughput

**Delayed passenger show-up due to upstream processes**
Space | Time | Throughput
TRANSFER

COVID-19 IMPACT ANALYSIS
TRANSFER | CHANGED PASSENGER FLOW („WHAT-IF“)

SCHENGEN → SCHENGEN

› Pre-Covid

De-Boarding: Walking: Departure Gate Closure

e.g. 15 min  e.g. 10 min  e.g. 15 min  \[\sum 40 \text{ min}\]

› Post Covid: Potential Health Check (separate checkpoint)

De-Boarding: Bus Transport/Walking: Health Check: Departure Gate Closure

Bus Transport/ e.g. 15 min +5 min  e.g. 10 min +5 min  e.g. +10 min  e.g. 15 min  \[\sum 60 \text{ min}\]

Walking:

› Post Covid: Potential Health Check at Immigration (→ mixing with other passengers)

De-Boarding: Bus Transport/Incl. Health Check (Transfer) Security Control*: Departure Gate Closure

Bus Transport/Incl. Health Check: (Transfer) Security Control*: Departure Gate Closure

e.g. 15 min + 5min  e.g. 10 min + 5min  e.g. +15 min  e.g. +10 min  e.g. 15 min  \[\sum 75 \text{ min}\]

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* Not desired but may be necessary because of mixing with unclean passengers and layout
INCREASED CONNECTION TIME REQUIREMENTS

- IF additional transfer processes are necessary → MCT of 45 min could turn into 60-75 min.

ANALYSIS OF EXAMPLE HUB AIRPORT

- 30-45% transfer pax affected (< 1h15 connection time)

MITIGATION OPTIONS

- Avoidance of unnecessary mixing with unclean passengers.
- Efficient transfer checkpoints/fast track
- Allocation to reduce walking time
- Check at final destination?

Example: Actual data from major European airport pre-covid
SUMMARY

TIME AND SPACE IMPACT ON ENTIRE PASSENGER JOURNEY
WHERE DOES COVID 19 ADD TIME?

Health Check
- Not mandatory yet
- Test before travel off-airport or close to airport before travel currently seems more likely

\[+ 0\text{-}15 \text{ min (if implemented)}\]

Check-In
- Health questions at counter make agent check-in mandatory, if not online
- Check-in former carry-on luggage
- Timatic travel restrictions

\[+ < 3 \text{ min (transaction)}\]
\[+ 0\text{-}30 \text{ min (additional waiting, if airlines do not adjust staffing to higher demand / cannot react on changes of volatile schedule (STD,LF))}\]

Security Control
- No additional process required
- But throughput reduction requires higher staffing ratio

\[+ 0\text{-}30 \text{ min (additional waiting (if security does not adjust staffing to reduced throughput))}\]

Gate Holdroom
- Late originating pax at gate as described by upstream processes
- Late transfer pax, if more extensive transfer process
- Add. processes (e.g. health checks, Timatic checks, bags)

\[+ x \text{ min}\]

Boarding / Turnaround
- Social distance
- Changed boarding procedure
- Intense cleaning / disinfection cabin

\[+ < 3 \text{ min (self organized’ by keeping distance)}\]
\[+ 10 \text{ min (with changed boarding procedure)}\]
\[+ 3 \text{ min (if disinfection is done after turnaround)}\]

\[\Rightarrow + \sum 0 \text{ to } 10 \text{ min …and more}\]

Mandatory delay
Risk factor for delay
WHERE DOES COVID-19 REQUIRE MORE SPACE?

**Health Check**
- Physical distance in queues
- Earlier show-up of pax
- Higher demand at counters
- Adjustment of staffing or higher efficiency?

→ **+50% queuing space** (with 1.5m SD)
→ **+50%** if staffing does not react adequately
→ **+XX** Extra hold space early pax

**Check-In**
- Physical distance in queues

**Security Control**
- Physical distance in queues
- Lowered throughput
- Adjustment of staffing?

→ **+100% queuing space** (with 1.5m SD and throughput reduction)
→ **+100-200%** queuing space if staffing does not react adequately

**Gate Holdroom**
- No use of every other seat
- Social distance when standing / walking
- Space loss due to allocation constraints

→ **+35-50% dwell area**

**Boarding Counter**
- Social distance in boarding queue

→ **+0-100%** (depending how passengers are called to counter)

Space req. depends on:
- Kind of check
- # flights or pax to check
- Process time
- Desired LoS

→ "size" tbd
(if implemented)
OVERALL IMPACT ON PASSENGERS’ JOURNEY | TIME

WHERE DOES COVID 19 ADD TIME?

Deboarding
- Physical distancing (inside cabin, passenger buses etc.)
- Head start for luggage

Around 5 min

Health Check (if implemented)
- Not generally regulated mandatory yet
- Different regulations in EU countries
- Performing full test currently seems more likely not airside

+ 0 -15 min
(if implemented)

Immigration
- In case of no separate health check, immigration might ask more detailed questions, check self-declaration etc.
- More critical when e-gates for EU Passports not used anymore
- Process itself is short but might lead to longer waiting time

+ 10 – 30 min

Baggage Reclaim
- No general change to baggage delivery process
- BUT – if airport has space constraints in reclaim area and pax arrive before bags, pax might need to hold somewhere else (aircraft, bus, or other holding area)

+ 0 - 15 min

+ $\sum 5$ to 20 min ...and more
Excluding health check

Mandatory delay
Risk factor for delay

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OVERALL IMPACT ON PASSENGERS’ JOURNEY | SPACE

WHERE DOES COVID 19 ADD SPACE?

Deboarding
- No additional space requirements regarding terminal building
- More buses per flight needed for remote handling

Health Check
- Not generally regulated / mandatory yet
- Different regulations in EU countries
- Extra processes require extra space (from simple QR-code check towards complex PCR test)

Immigration
- Physical distancing in queues
- Longer queues if additional flights from Schengen risk areas need to be re-directed and checked here

Baggage Reclalm
- Physical distancing around belts requires more space
- If pax arrive before bags (critical):
  - No allocation of every other belt
  - Waiting zones for group members
- If bags arrive before pax
  - Extra space to store bags and arrange 1-directional pick-up trail

→ No additional space

→ Depends on operational principle
  → Example: C19 test of 500 pax/h → 1,000 m²

→ +100% queuing space (with 1.5m PD)
  → + XX if staffing does not react adequately

→ +30-50% space (with 1.5m PD)

Mandatory space requirement
Risk factor for additional space requirement
THANK YOU!

UTA KOHSE, MANAGING PARTNER
MARC ILLING, SENIOR CONSULTANT
uta.kohse@arc-aachen.de