Innovative Baggage Delivery for Sustainable Air Transport
Outline

- Trends in Air Transport
- IATA visions and programs
- Passenger and baggage dissociation
  - concept, benefits, challenges, technology
- Conclusions

*Pre-warning:*

I will explain main idea, but challenges, implementation, benefits etc. are simply too big and too complex to discuss here in detail.
**Trends in Air Transport**

- **Markets size forecast:**
  - largest by 2034: China (1.3bn), USA (1.2bn), total (7.3bn)
  - fastest growth: China, USA, India, Indonesia, Brazil
  - Europe (UK, Germany, Spain, France, Italy) drops behind

- **Key demand drivers:**
  - 1. living standard, 2. population & demographic, 3. price & availability
Challenges and Visions

- **Infrastructure, processes and systems**
  - have not changed over 40 years, dated, inefficient, complex

- **Passenger experience**
  - queuing, disruptions, mishandled bags → delays → costs

- **Main concerns**
  - safety and security (likely #1 even in 2050)
  - profitability (generally very poor ROIC): increased load factors → delays, service quality
  - infrastructure expansion: new airports in China vs. banned Heathrow expansion in UK
  - business models: heterogeneous ownerships, revenue-sharing
  - technology: emissions, noise pollution levels
IATA Programs

• Simplifying the Business
  - improve passenger experience, security, safety, efficiency, space/staff/assets utilization
  - empower airline retailing, provide real-time trusted info, reduce wait times, define data models etc. etc.
  - passenger autonomy: self-checking, self-tagging, self-drop-off
Aircraft Payload

- average seat occupancy 80%:
  - $6 per passenger
  - $2.40 per kg of cargo
  (tariffs manage the demand)

- 20-33 tons of passengers with hand luggage;
- 7-15 tons of checked-in luggage;
- 23-28 tons of cargo;
- 50-76 tons of the total payload
Passengers & Baggage Dissociation

Main drivers
- passenger experience
- system capacity (better utilize space, assets, resources)
- also: security, (fuel) efficiency, profit generation
Passengers & Baggage Dissociation

- **Passenger experience**
  - assistance with baggage
  - less queuing & waiting (faster boarding)
  - easier to travel to/from airports (40,000 moves to/from Manchester airport daily)

- **Efficiency**
  - payload flexibility (cargo vs. baggage)
  - fuel efficiency (cost index)
  - remote security and customs clearance

- **Profits**
  - new differentiated baggage services (delivery timing & pricing → incentives)
  - new aircraft and airport designs
Our Vision

- **Baggage delivery**
  - minimize number of hops (especially among large hubs)

- **3rd party services**
  - cargo+baggage shared delivery (flights) for airlines
  - delivery to/from airports

- **End-to-end delivery**
  - drop-off points, home collection service
  - exploit existing parcel services (DHL, UPC, TNT)
  - outsource operations from airports (check-in, baggage drop-off and collection)
  - baggage tracking (on a mobile phone)
## Flights Study

\[ B = \alpha \cdot C \quad \frac{1}{3} \leq \alpha \leq \frac{1}{2} \]

\[ N_B \approx N_{\text{tot}} \cdot \frac{\alpha}{1 + \alpha} \]

<table>
<thead>
<tr>
<th>Orig.</th>
<th>Dest.</th>
<th>dur.</th>
<th>direct</th>
<th>1 stop</th>
<th>2 stops</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDI</td>
<td>PEK</td>
<td>&lt; 24h</td>
<td>0</td>
<td>42</td>
<td>94</td>
<td>136</td>
</tr>
<tr>
<td>DUB</td>
<td>PEK</td>
<td>&lt; 24h</td>
<td>0</td>
<td>49</td>
<td>62</td>
<td>111</td>
</tr>
<tr>
<td>LHR</td>
<td>PEK</td>
<td>&lt; 24h</td>
<td>3</td>
<td>103</td>
<td>21</td>
<td>127</td>
</tr>
<tr>
<td>EDI</td>
<td>FCO</td>
<td>&lt; 12h</td>
<td>1</td>
<td>27</td>
<td>15</td>
<td>43</td>
</tr>
<tr>
<td>DUB</td>
<td>FCO</td>
<td>&lt; 12h</td>
<td>2</td>
<td>43</td>
<td>10</td>
<td>55</td>
</tr>
<tr>
<td>LHR</td>
<td>FCO</td>
<td>&lt; 12h</td>
<td>3</td>
<td>80</td>
<td>2</td>
<td>85</td>
</tr>
<tr>
<td>EDI</td>
<td>DXB</td>
<td>&lt; 12h</td>
<td>0</td>
<td>52</td>
<td>6</td>
<td>58</td>
</tr>
<tr>
<td>DUB</td>
<td>DXB</td>
<td>&lt; 12h</td>
<td>4</td>
<td>63</td>
<td>7</td>
<td>74</td>
</tr>
<tr>
<td>LHR</td>
<td>DXB</td>
<td>&lt; 12h</td>
<td>20</td>
<td>102</td>
<td>5</td>
<td>127</td>
</tr>
<tr>
<td>EDI</td>
<td>JFK</td>
<td>&lt; 18h</td>
<td>0</td>
<td>89</td>
<td>23</td>
<td>112</td>
</tr>
<tr>
<td>DUB</td>
<td>JFK</td>
<td>&lt; 18h</td>
<td>8</td>
<td>66</td>
<td>9</td>
<td>83</td>
</tr>
<tr>
<td>LHR</td>
<td>JFK</td>
<td>&lt; 18h</td>
<td>69</td>
<td>141</td>
<td>11</td>
<td>221</td>
</tr>
<tr>
<td>EDI</td>
<td>PIT</td>
<td>&lt; 18h</td>
<td>0</td>
<td>4</td>
<td>51</td>
<td>55</td>
</tr>
<tr>
<td>DUB</td>
<td>PIT</td>
<td>&lt; 18h</td>
<td>0</td>
<td>30</td>
<td>61</td>
<td>91</td>
</tr>
<tr>
<td>LHR</td>
<td>PIT</td>
<td>&lt; 18h</td>
<td>0</td>
<td>156</td>
<td>51</td>
<td>207</td>
</tr>
<tr>
<td>EDI</td>
<td>GIG</td>
<td>&lt; 24h</td>
<td>0</td>
<td>9</td>
<td>35</td>
<td>44</td>
</tr>
<tr>
<td>DUB</td>
<td>GIG</td>
<td>&lt; 24h</td>
<td>0</td>
<td>7</td>
<td>52</td>
<td>59</td>
</tr>
<tr>
<td>LHR</td>
<td>GIG</td>
<td>&lt; 24h</td>
<td>1</td>
<td>42</td>
<td>33</td>
<td>76</td>
</tr>
<tr>
<td>EDI</td>
<td>SYD</td>
<td>&lt; 32h</td>
<td>0</td>
<td>6</td>
<td>104</td>
<td>110</td>
</tr>
<tr>
<td>DUB</td>
<td>SYD</td>
<td>&lt; 32h</td>
<td>0</td>
<td>17</td>
<td>44</td>
<td>61</td>
</tr>
<tr>
<td>LHR</td>
<td>SYD</td>
<td>&lt; 32h</td>
<td>0</td>
<td>93</td>
<td>65</td>
<td>158</td>
</tr>
</tbody>
</table>
Implementation

- **Ideally**
  - end-to-end dissociation of passengers and baggage
- **Realistically**
  - first air segment only, OR partial dissociation, OR first ground segments (to/from airports) only
- **Challenges**
  - changes to regulations and processes (happening anyway, e.g. mandatory to record all baggage handling steps from 2018)
  - baggage ownership at all times (involvement of 3rd parties)
  - appropriate technology
- **Phased-in roll-out**
  - aligned with existing IATA programs and visions
  - seems to be good support from IATA/airlines and aircraft manufac.
Technology

- Exists or under development
  - baggage self-tagging
  - baggage tracking
Physical Internet

  - delivery of physical objects similarly to TCP/IP Internet
  - fully operational in about 30 years

- **Main characteristics**
  - modularity, encapsulation (standardized containers)
  - protocols, interfaces

- **Our concern**
  - how will it affect the need for passenger travel?
Conclusions

- **Dissociation of passenger and baggage**
  - simple idea, complex implementation, but rewards can be huge
  - new business/profit opportunities
  - improved passenger experience
  - may be necessary for sustainability

- **Support indicated by**
  - IATA (aligned with their programs and visions)
  - airlines (Qantas, ¼)
  - airports (Manchester, Copenhagen, ¼)

- **New aircraft designs**
  - number of recent patents by Airbus
  - non-stop very long-haul flights
  - $$$ billions opportunity
Thank you!