

Security and BHS

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Outline

- Broad impact of security considerations and issues
- Security tasks
- Baggage handling systems (BHS)
- Hold baggage processing
- Examples and statistics
- Current developments

Increasing Importance of Security-Related Issues

- ❑ Over the past 25 years, and especially since 2001, security has become
 - The most important source of uncertainty in planning for passenger terminal facilities
 - The fastest-growing cost element at airports
- ❑ Security regulations change rapidly in response to events and airport planners and operators have no choice but to comply with any change mandates
- ❑ Changes may affect not only security processing requirements (facilities, equipment, personnel) but also fundamental aspects of air transport operations (e.g., liquid-explosives scare of 2006 => 20% increase in checked bags)

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Costs of Security

- ❑ Cost of passenger screening at airport terminals is roughly \$6 billion per year (TSA cost plus equipment cost)
- ❑ 1,100 EDS and 6,000 Explosive Trace Detection machines at 429 airports installed in 2002 – 2004!
- ❑ Cost in Europe is roughly \$4 billion (similar to US on a per passenger basis)
- ❑ Security processing and “early presentation” requirements also increase the time that passengers allocate to travel
- ❑ Cost of this additional time may be huge; for example:
(20 extra minutes per departing passenger)x(500 million passengers)x(\$0.5 per passenger minute)
= \$5 billion!

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Who Pays?

- ❑ Passengers and airlines in US pay for roughly 50% of the \$6 billion airport security costs through ticket taxes and charges to airlines
- ❑ General tax funds pay for the remainder
- ❑ User burden varies widely from country to country
- ❑ Users requiring special services often pay extra
- ❑ European Parliament (summer 2006): “Aviation security is a government responsibility; governments should pay for most of the costs, except when special arrangements are sought”
 - Principle not applied to date

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Who Provides the Service?

- ❑ Varies widely according to national law:
 - Government (special agency like TSA; national Police; national Army)
 - Airport operator
 - Subcontractor (“outsourcing”)
- ❑ In all cases, national government retains responsibility for authorizing and monitoring arrangements
- ❑ Labor issues arising with increasing frequency; can disrupt airport operations

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Centralized vs Decentralized Arrangements

- In centralized arrangements, passengers are screened soon after check-in, typically before entering concessions area
- In decentralized arrangements, passengers are screened at the entrance of the gate lounges or of the bus gates
- Advantages and disadvantages to both arrangements
 - Economies of scale
 - Effectiveness of screening
 - “Sterility” of concession areas
 - Impact on concession revenues
 - Passenger perceptions of LOS

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Major Security Tasks

- Passenger and Hand Baggage Screening
- Hold Baggage Screening
- Access Control
- Baggage Reconciliation

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What Is “Best” Configuration of Screening Devices?

$P = \text{Prob}[\text{declare safe, given a dangerous bag}]$

$Q = \text{Prob}[\text{declare unsafe, given a harmless bag}]$

Two independent detectors

$P_1 = 0.1, Q_1 = 0.01$

$P_2 = 0.04, Q_2 = 0.01$

Loading Policy	Conditional Probability of Loading a Dangerous Bag	Conditional Probability of Rejecting a Harmless Bag
Declared Safe by Either Detector	13.6% [= $P_1 + (1 - P_1) * P_2$]	0.01% [= $Q_1 * Q_2$]
Declared Safe by First Detector	10% [= P_1]	1% [= P_2]
Declared Safe by Both Detectors	0.4% [= $P_1 * P_2$]	1.99% [= $Q_1 + (1 - Q_1) * Q_2$]

Source: Prof. A. Barnett

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Baggage Reconciliation

- Or “Positive Passenger Bag Matching” (PPBM)
- Assures that passengers and their bags are on same flight
- Mandatory on international flights and in many countries on domestic flights
- Optional for domestic flights in US: practiced by all US airlines in 2002, mostly abandoned in beginning of 2003, in favor of EDS
- But not an “either / or” proposition!
- Estimated impact on US domestic flights:
 - ~ 1.5% of departures would be delayed
 - given a late departure, average delay would be 14 minutes
 - Cost to airlines and passengers ~ \$100 million per year
- Worthwhile?

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“Exceptionalism” of International Flights to US

- ❑ Special screening requirements
 - Pre-processing of passengers
 - Passenger list transmission
 - CTX 5500, CTX 9000 machine screening is required (must often go through entire BHS)
 - Sales of duty-free liquor, etc
- ❑ Additional security charges paid

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Baggage Claim (Arriving Passengers)

- ❑ Simplest, as a process, part of baggage handling
- ❑ Yet, may be the most important as far as passenger perceptions are concerned
- ❑ Passenger information is critical in shaping perceptions
 - “Time to first baggage”, etc
- ❑ IATA guidelines:
 - ~ 0.3 m (~1 ft) of linear frontage per passenger for bag claim devices (wide body: ~ 80 – 120 m; narrow body: ~ 30 – 50 m)
 - ~ 9 m (or more) between bag claim devices
- ❑ Issue of load distribution for terminals sharing flights subject to or exempt from customs inspection (e.g., extra-Schengen vs. Schengen)
- ❑ Bag claim halls at large terminals may be vast, especially when many long-range flights are involved

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Ongoing Developments

- ❑ Very fast evolution of BHS
- ❑ Increased sophistication, complexity, automation
- ❑ “Demise” of linear, decentralized terminal concept has given further impetus
- ❑ Huge costs (e.g., Amsterdam system of ~\$500 million)
- ❑ Increased role of radio frequency identification (RFID) technologies: more reliable than bar code tags, can incorporate a lot of information, cost is rapidly declining)
- ❑ “Big players” entering the field

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Theoretical vs. Actual Performance

- ❑ The actual performance and capacity of large and complex BHS often falls far short of the theoretical values
- ❑ Numerous technical problems may surface (e.g., unreliable mechanical components, difficulty in reading tags)
- ❑ Flow control problems may also contribute to serious performance deterioration (e.g., queuing problems, bottlenecks, load imbalances)
- ❑ Denver International in the 1990s is well-known example (\$500 million increase in cost, 15 months of delay in airport opening at \$30 million per month)

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