

Assessing the safety of airport surface operations: A 4D process model

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Introduction

Background

- Due to the complexity of infrastructure and the interaction of various stakeholders the **airport surface** (i.e. runways and taxiways) is considered the **most vulnerable phase of flight**
- Effective safety mitigation strategies are crucial**

Airlines, Pilots



Airport authority



Regulators



Vehicles / pedestrians



External stakeholder



ANSPs, ATC

Limitations

- Piecemeal approach** in the industry
- Focus on specific aspects of surface safety depending on interests and immediate responsibilities of aviation stakeholders

Objective

- Holistic** model of airport surface safety that integrates the **viewpoints of all relevant aviation stakeholders**

Methodology

Data inputs



- Literature, operations manuals, standards, procedures, etc.



- Global airports survey



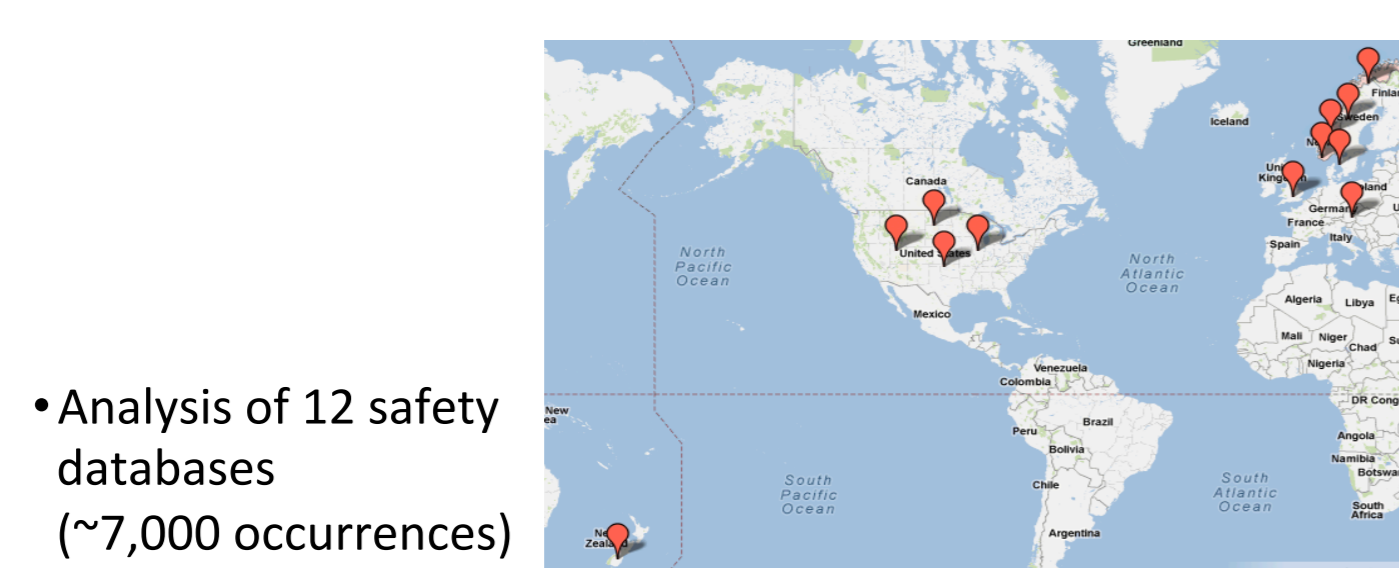
- Observations and Interviews
- Validation with SMEs

Pilots

Airports

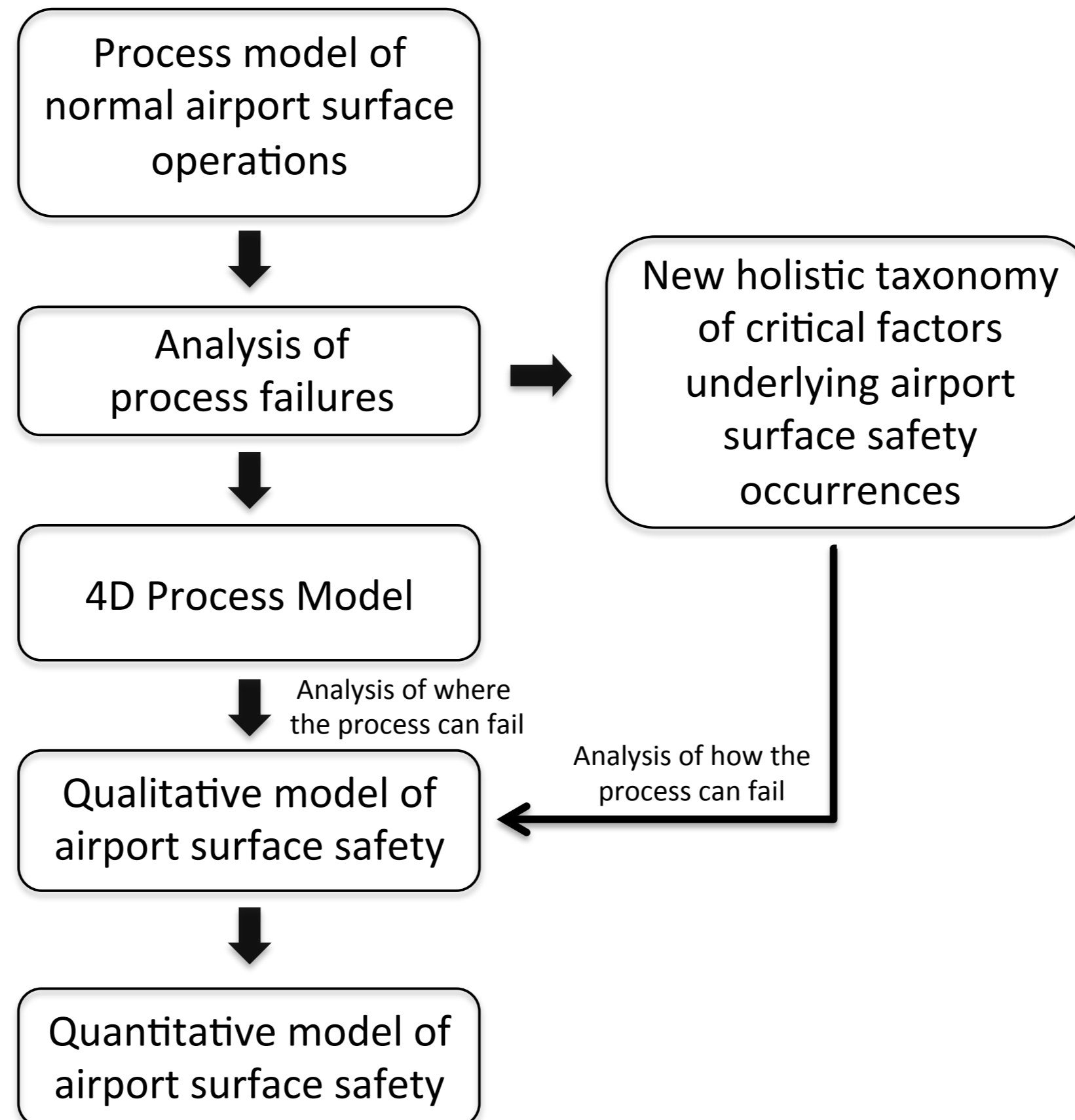
Operational personnel

ATC



- Analysis of 12 safety databases (~7,000 occurrences)

Simplified methodology

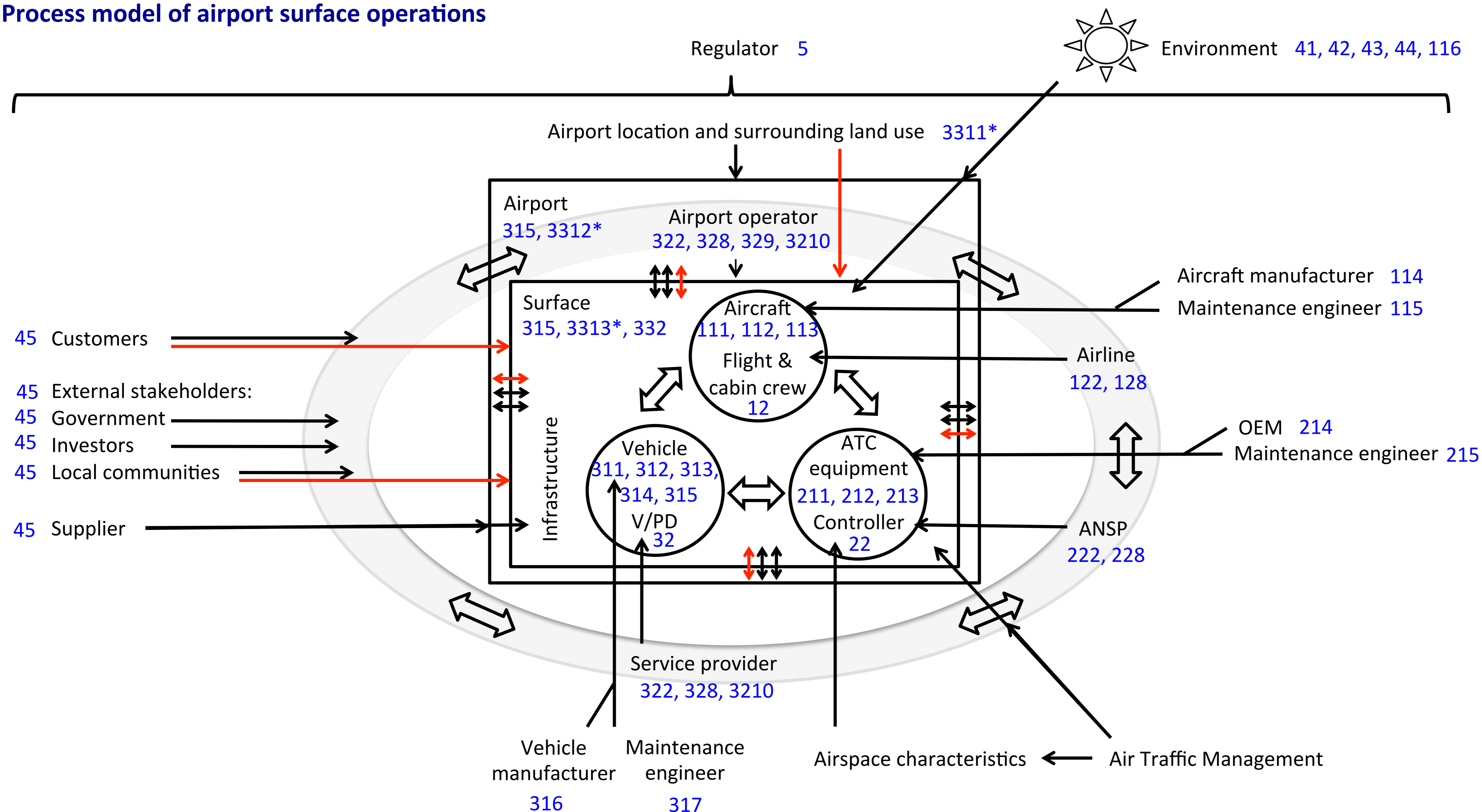


Collaboration partner

- UK Civil Aviation Authority
- Civil Aviation Authority of New Zealand
- Civil Aviation Authority – Norway
- Federal Aviation Administration
- Massachusetts Port Authority
- Oslo Lufthavn
- Avinor
- Norwegian Air Shuttle
- easyJet
- American Airlines
- Signature Flight Support

Results

Process model of airport surface operations



Process failures (see legend for more details)
 → Stochastic elements

- Legend**
- 1 Aircraft operations**
 - 11 Aircraft – Technical
 - 111 Aircraft technical failure
 - 112 Aircraft weight and balance
 - 113 Master caution warning
 - 114 Aircraft design/manufacturing
 - 115 Aircraft improper maintenance
 - 116 Environmental influences
 - 117 Other
 - 12 Pilot – Human
 - 121 Resources
 - 122 Competence
 - 123 Communications
 - 124 Situational awareness
 - 125 Human-machine interface
 - 126 Human reliability
 - 127 Team operations
 - 128 Procedures
 - 2 ATC**
 - 21 ATC – Technical
 - 211 Surveillance system
 - 212 Navigation system
 - 213 Communication system
 - 214 Equipment design/manufacturing
 - 215 Equipment improper maintenance
 - 216 Other
 - 22 ATC – Human
 - 221 Resources
 - 222 Competences
 - 223 Communications
 - 224 Situational awareness
 - 225 Human-machine interface
 - 226 Human reliability
 - 227 Team operations
 - 228 Procedures
 - 3 Airport operations**
 - 31 Airport – Technical
 - 311 Vehicle technical failure
 - 312 Radio communications
 - 313 Ground handling equipment
 - 314 Tugs
 - 315 Airport meteorological equipment
 - 316 Vehicle/equipment design
 - 317 Vehicle/equipment improper maintenance
 - 318 Other
 - 32 V/PPD – Human
 - 321 Resources
 - 322 Competences
 - 323 Communications
 - 324 Situational awareness
 - 325 Human-machine interface
 - 326 Human reliability
 - 327 Team operations
 - 328 Procedures
 - 329 Airport management
 - 3210 Airport operations
 - 33 Airport – Physical**
 - 331 Design
 - 332 Surface infrastructure and conditions
 - 4 Environment**
 - 41 Weather
 - 42 Geological disturbances
 - 43 Nighttime operations
 - 44 Wildlife
 - 45 External factors
 - 5 Regulatory system**
 - 51 Regulations not existent
 - 52 Regulations inadequate
 - 53 Regulations existent, but not implemented