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Impact of Bird Strikes on ATM Processes

Guido Schulze and Isabel Metz

DLR

Overview

- Goal: analyse operational impacts caused by bird strikes
- Method: literature, interviews, questionnaires, visits
- Result: three-level model including probabilities

P(x)

G. Schulze

pennula.de

dfs.de

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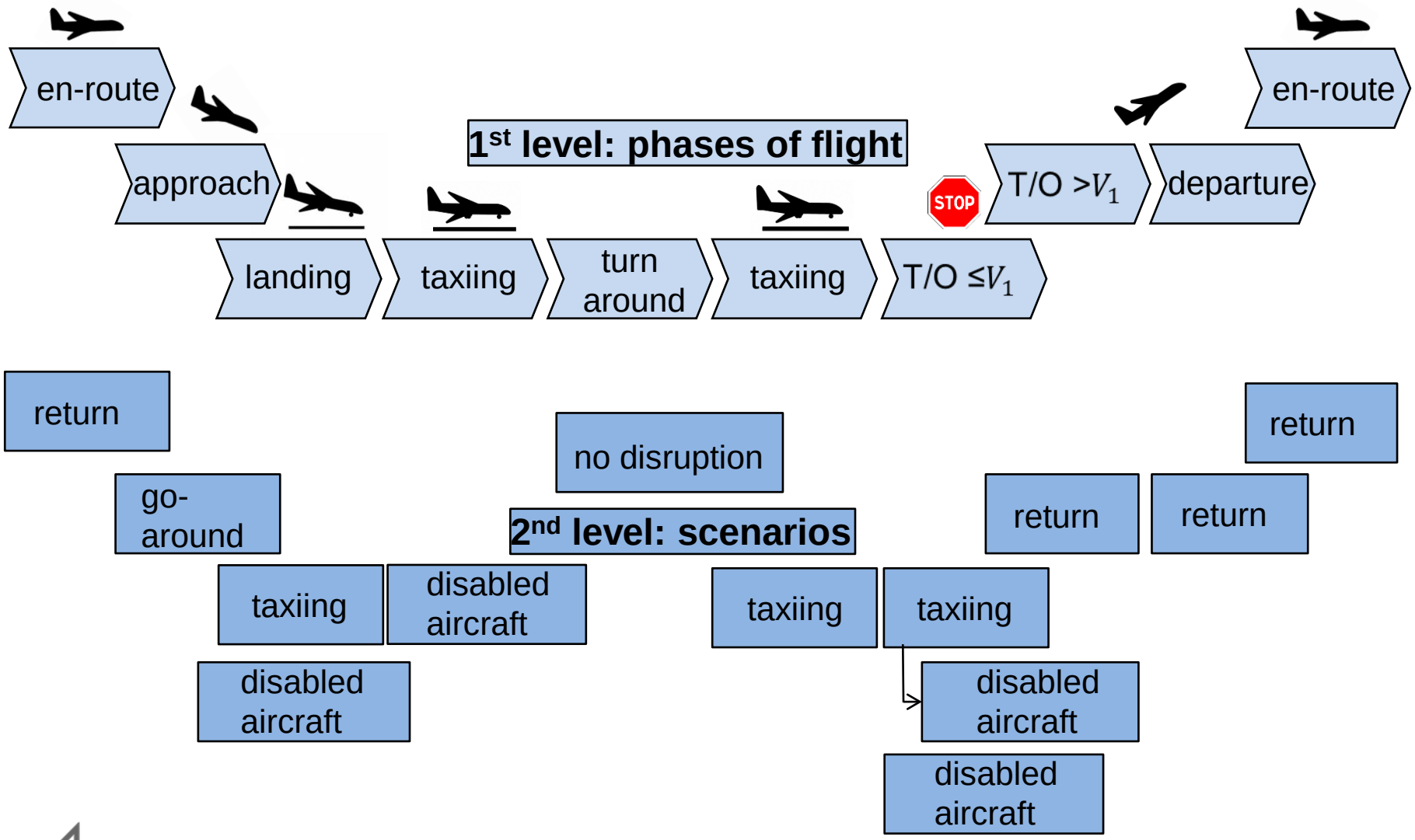
Model Overview I



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Model Overview II

3rd level: stakeholder processes

Aircraft operator	Airport	ATC
cockpit decision process	runway inspection	go-around process
Aircraft on Ground (AOG) process	apron control disruption process	ground ATCO process
	airport duty management disruption process	runway blockage process tower ATCO
	bird repelling	runway blockage approach ATCO
	emergency services ground alert	emergency/mayday
	emergency services airborne/inbound alert	

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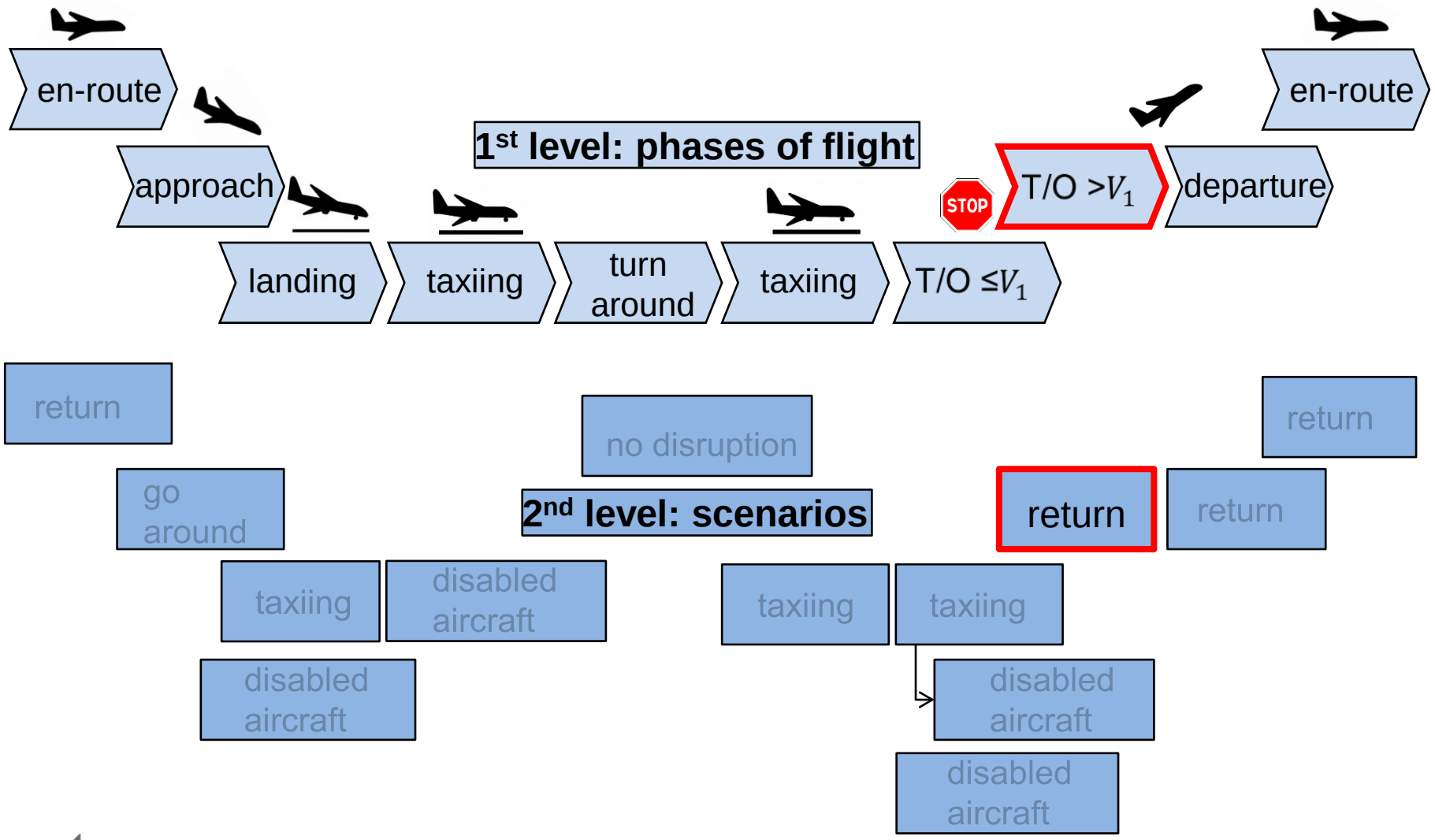
Example Scenario: Return



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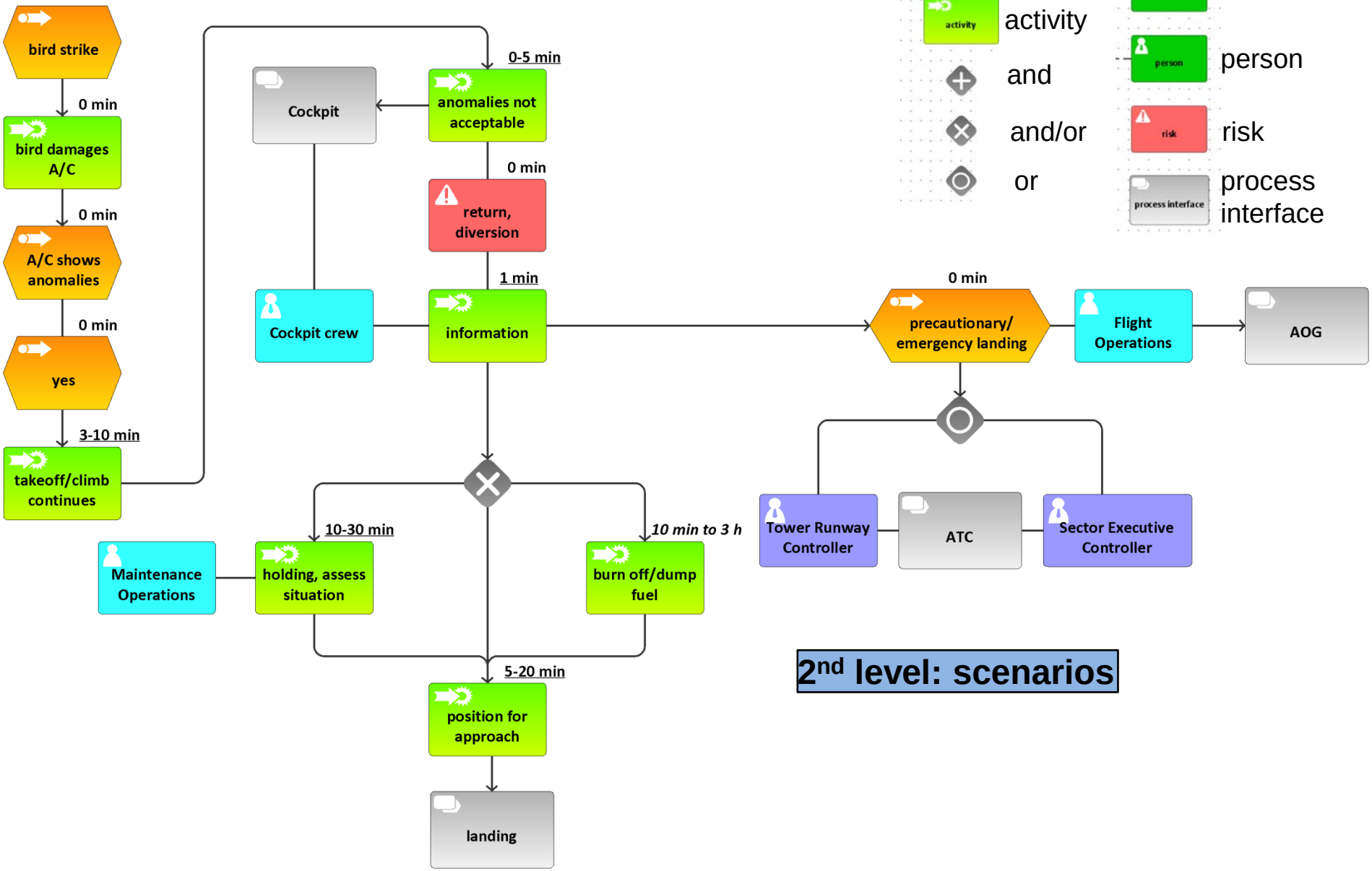

2nd level: scenarios

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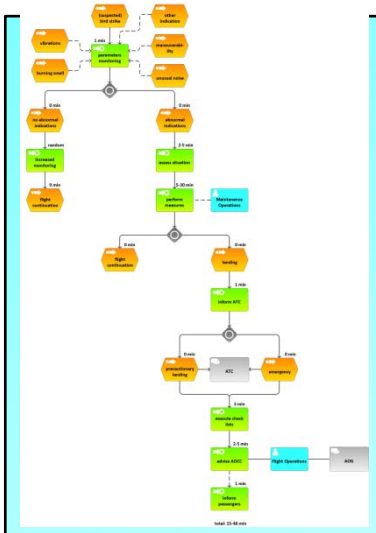
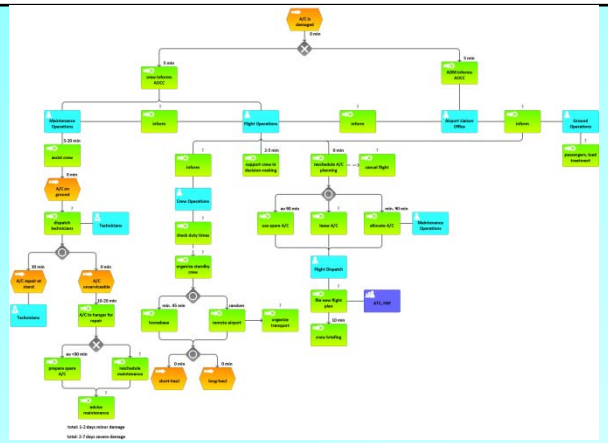
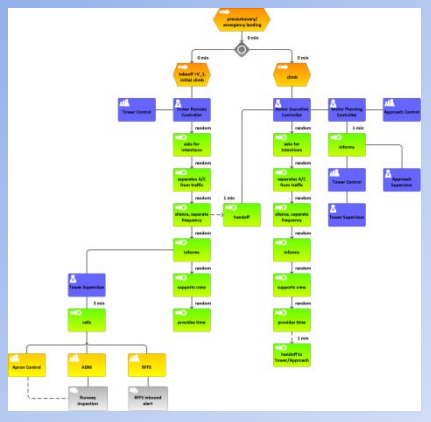
Example Scenario: Return



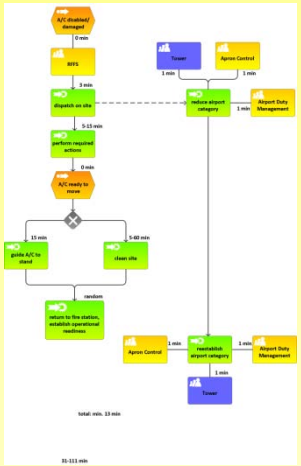


airline

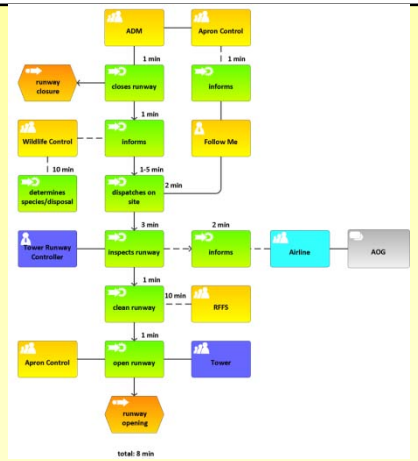


ATC

3rd level: stakeholder processes



airport



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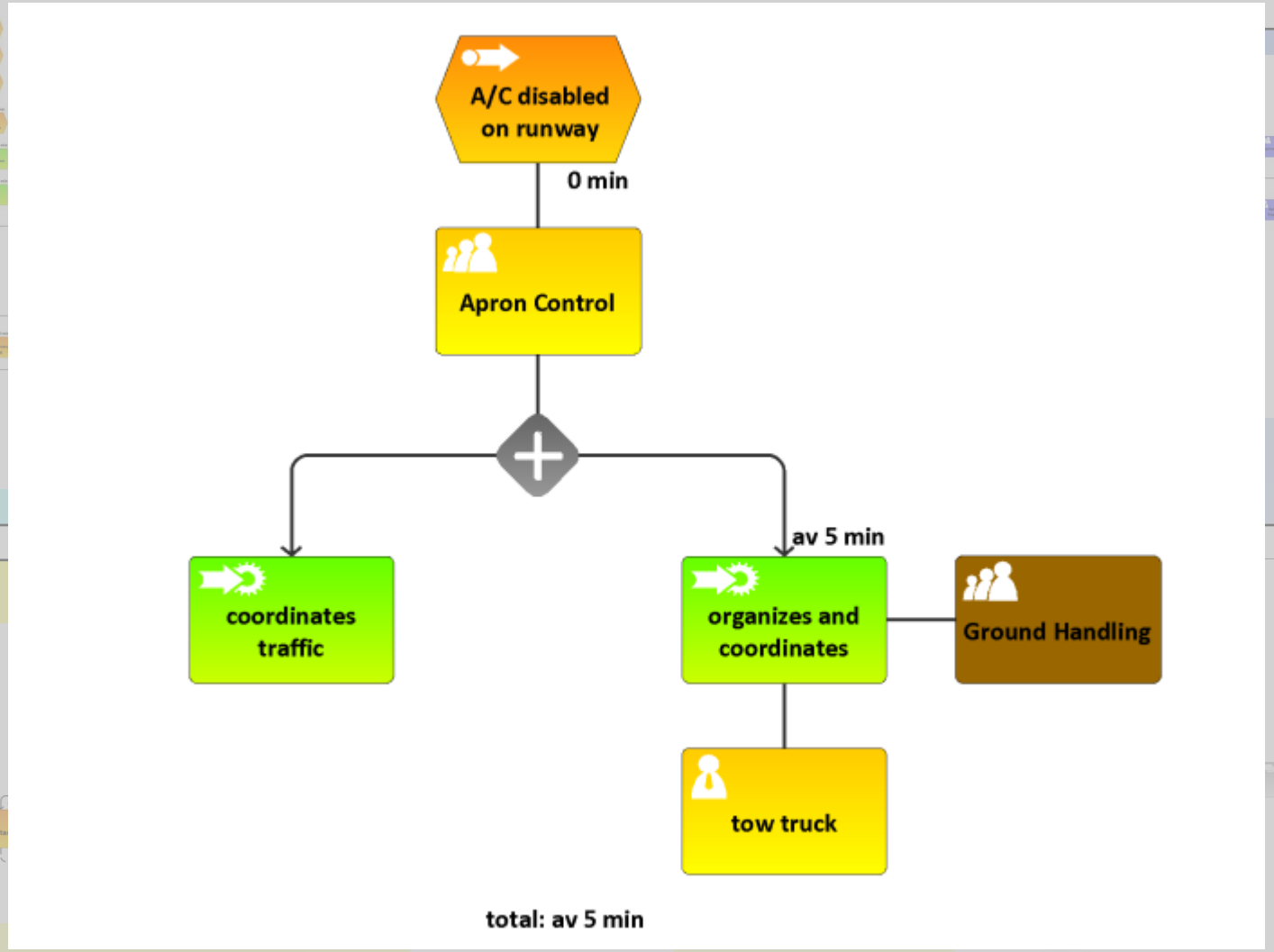

cockpit

airport

inspection

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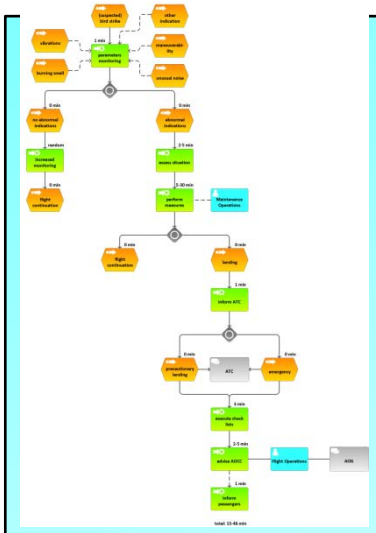
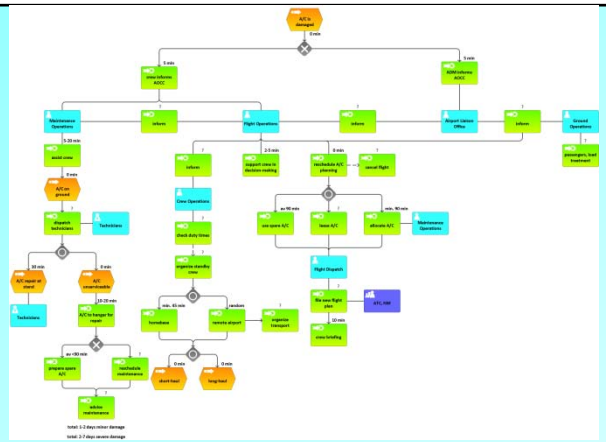
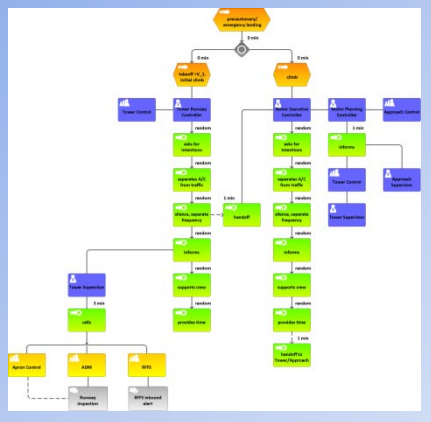
Example Scenario: Return



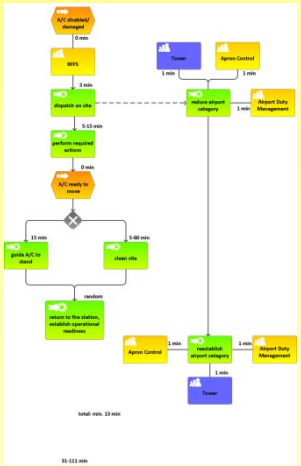


airline

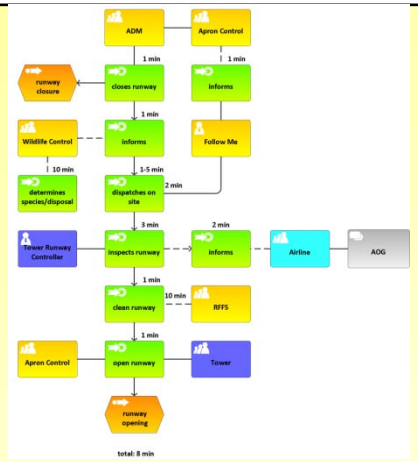


ATC

3rd level: stakeholder processes



airport



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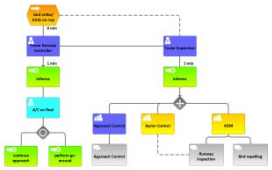
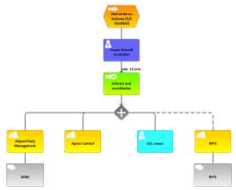
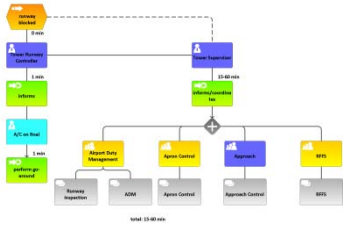
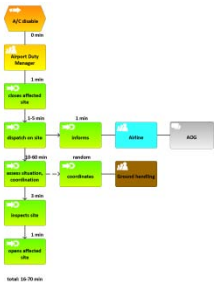
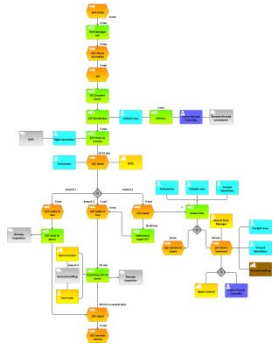
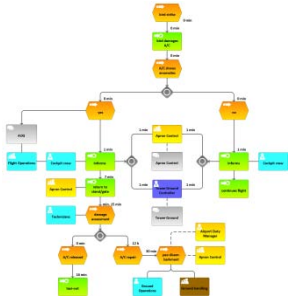
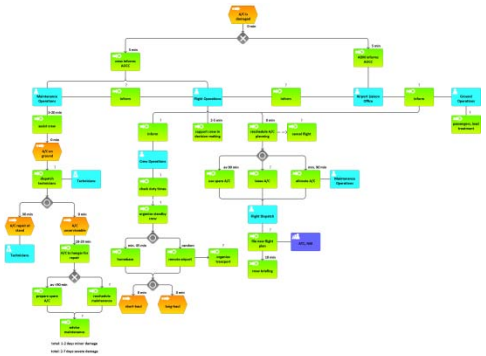
Overview: Scenarios and Processes



scenarios	processes	response times
10	63	163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Example Scenario: Return

Probability of Occurrence

- bird strikes reports:
  - ➢ number of bird strikes
  - ➢ impact on operations
- traffic data
  - ➢ 5.4 mio aircraft movements per year

$$P(x) = 9{,}8 \cdot 10^{-6}$$

per aircraft movement

year	bird strikes	bird strikes during take-off, climb, cruise	percentage in %	unscheduled landings	percentage in %
2010	1722	456	26,5	48	10,5
2011	1577	576	36,5	20	3,4
2012	1586	591	37,2	47	8,0
2013	1606	567	35,3	85	15,0
2014	1816	614	33,8	64	10,4
Ø/a	**1661**	**561**	**33,8**	**53**	**9,5**

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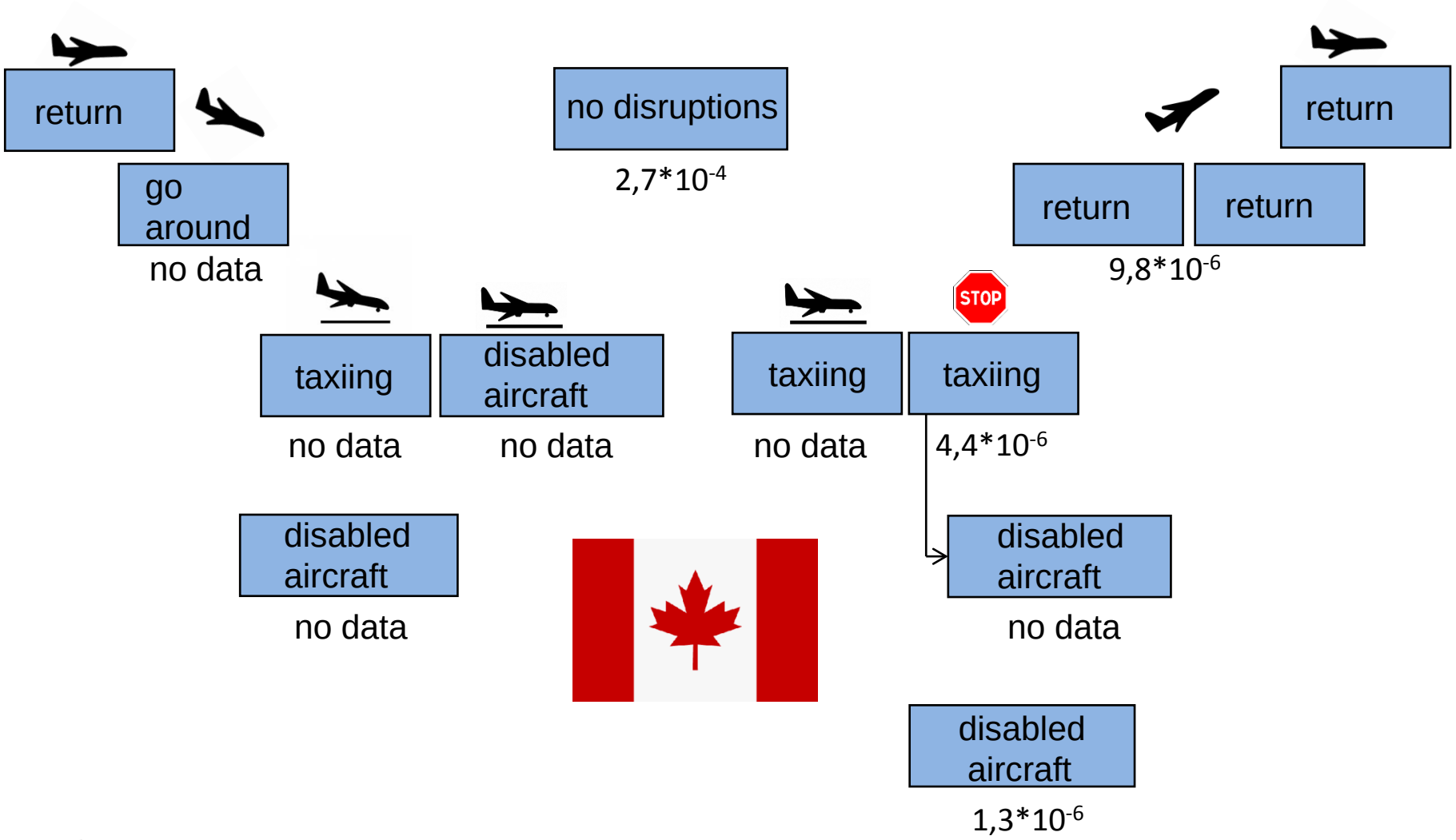
Probability of Occurrence for other scenarios



Risk Assessment: Disruption Potential

return

go around

AL: 15 min

APT: 8 min

ATC: 8 min

taxiing

AL: 15 min - days

APT: 8 min

ATC:8 min

disabled aircraft

AL: 40 min - days

APT: 18-86 min

ATC: 18-86 min

disabled aircraft

AL: 40 min - days

APT: 23-110 min

ATC: 0-110 min

no disruptions

AL: 15 min

APT: 0-8 min

ATC: 0-8 min

taxiing

AL: 38 min - 12 h

APT: 8 min

ATC: 0-8 min

STOP

taxiing

AL: 30 min - days

APT: 8 min

ATC: 8-20 min

disabled aircraft

AL: 47 min - days

APT: 23-110 min

ATC: 0-110 min

return

return

return

AL: 9 min - hours + landing

APT: 8 min + landing

ATC: 19 min - hours + landing

AL: airline
APT: airport
ATC: air traffic control

AL: 40 min - days

APT: 18-86 min

ATC: 18-86 min

disabled aircraft

Conclusions

this work

- generic three-level model
  - scenario probabilities
  - process times

for the airport stakeholders

potential future work

- cadcade effects
- monetary aspect
- other disruption causes

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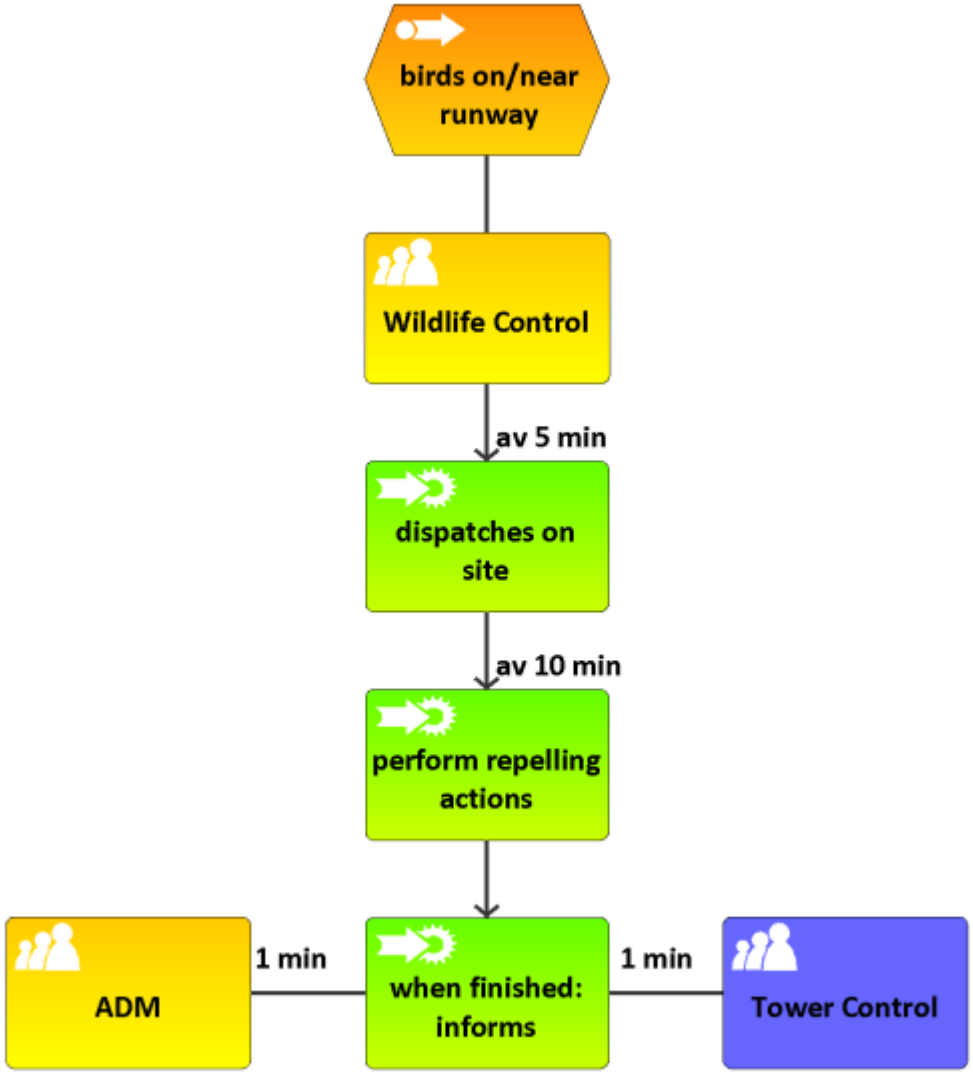
Thank you!

Questions?



total: av 17 min