

Results from SESAR Exercise at Hamburg Airport: Detection of Conflicting ATC Clearances

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Knowledge for Tomorrow

Clarification



DLR (FL) Performer this task as a fully paid sub-contractor for the German Air Navigation Service Provider DFS in the context of SESAR.



Concept and prototypes were developed under the SESAR programme and co-financed by the European Community and EUROCONTROL.



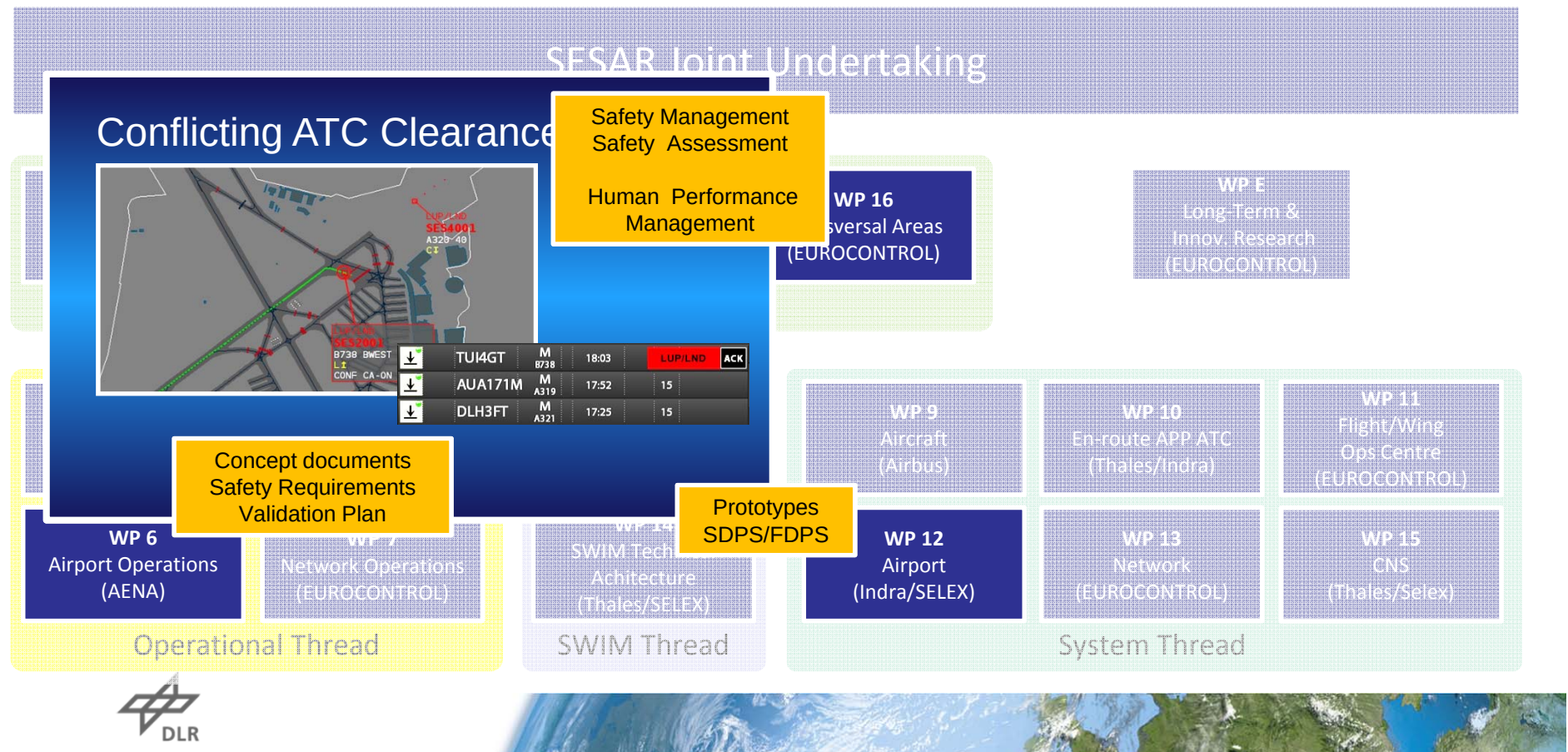
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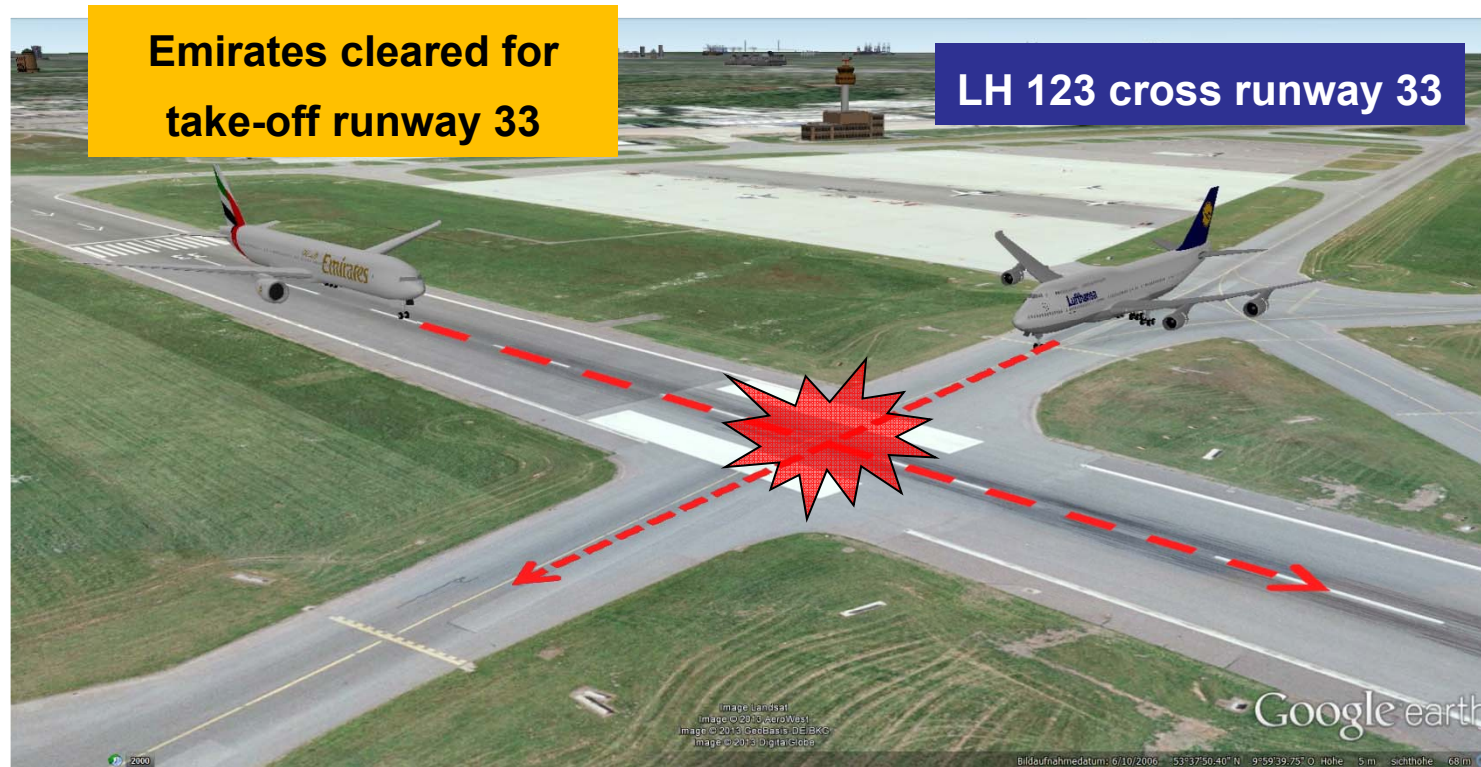
Overview SESAR



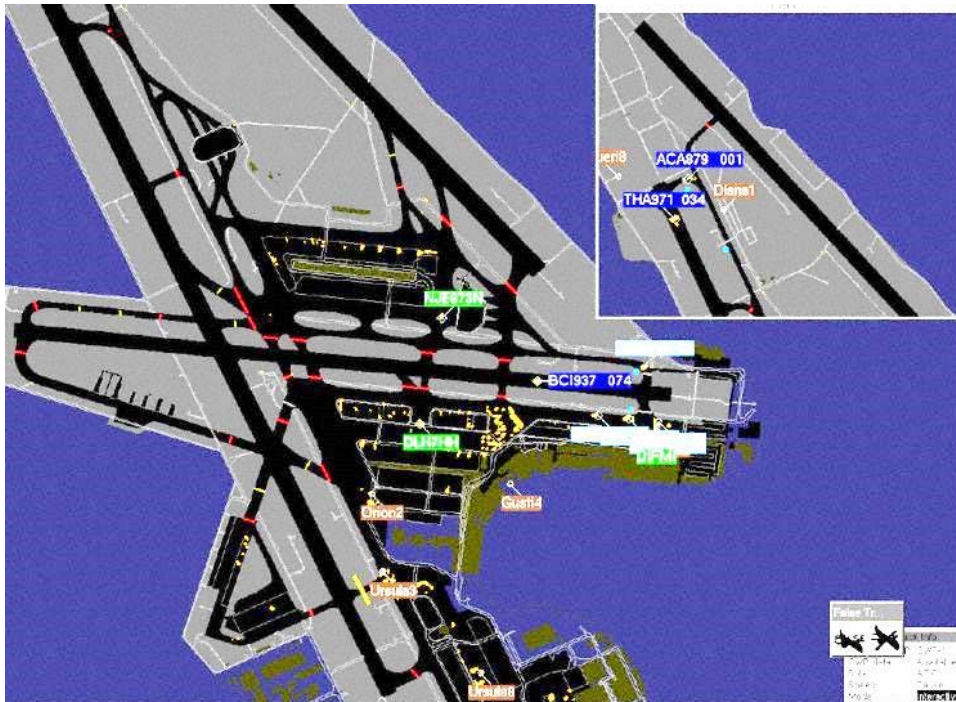
M Motivation



What is a „Conflicting“ ATC Clearance?



The Runway Incursion Monitoring System (RIMS)



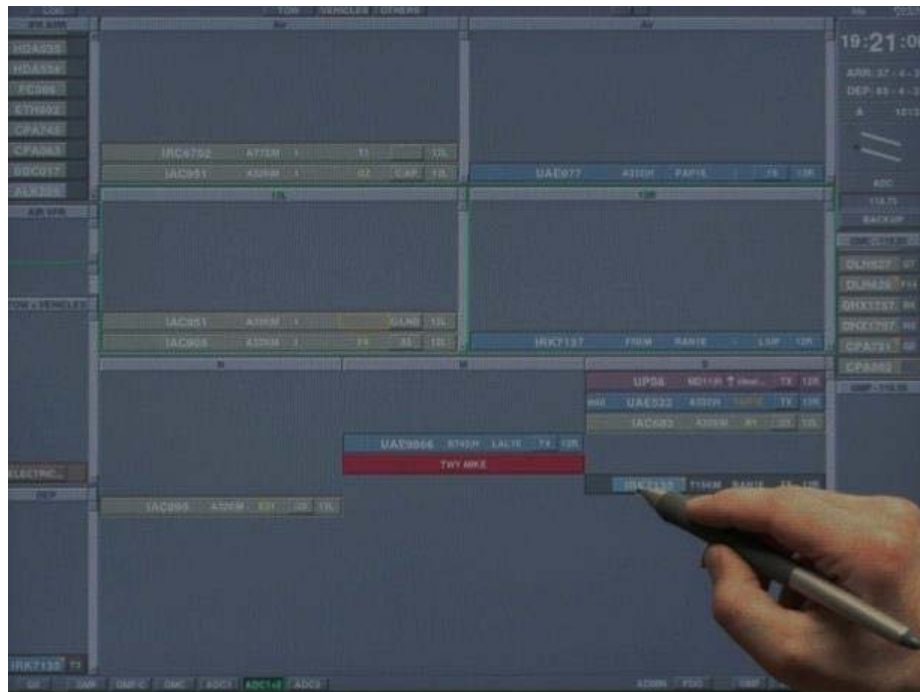
**RIMS alerts when two aircraft
are on ONE runway.**

***Why not EARLIER?
During the clearance?!***

Source: graphics: BFU; <http://avherald.com/h?article=443b5ca2>



An additional layer of safety should detect conflicting ATC clearances much earlier



During the controller inputs the clearances

The new safety net should performing crosschecks with the clearances and - in most cases - the aircraft position



O Objectives



Validation Objectives for SESAR Exercise at HAM

Feasibility

Fulfillment of operational requirements

Acceptance on the usability of the different alerts

Safety

All conflicting situations detected?

Allowing the controller to solve the detected situations timely?

False alert rate acceptable for the controller?

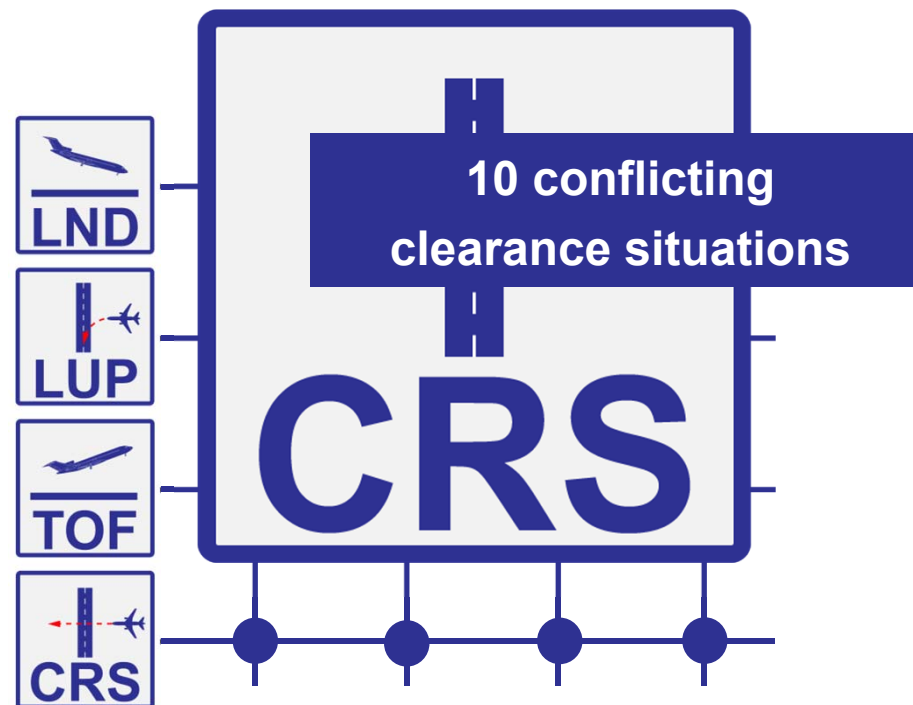
Some detections considered as nuisance alerts?



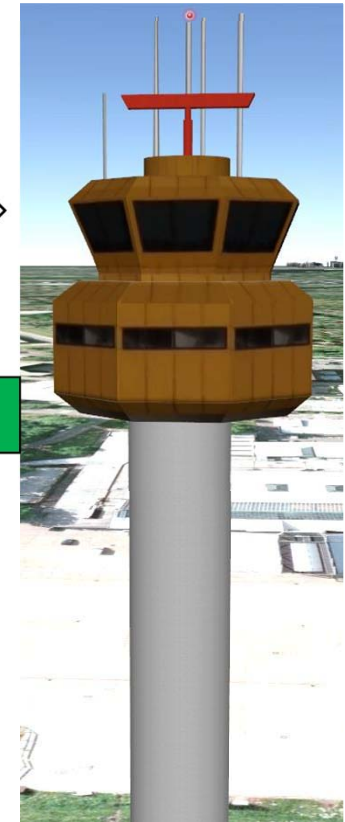
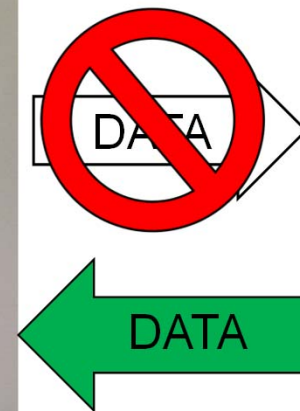
M **Method**



What is a „Conflicting“ ATC Clearance?



Shadow mode environment at Hamburg airport



All flight data was copied and re-routed to a separate, temporary control room set up for the duration of the exercise.



Results from SESAR Exercise at Hamburg Airport – Karsten Straube (German Aerospace Center) – SIDs 2013

Real and additional synthetic traffic



Results from SESAR Exercise at Hamburg Airport – Karsten Straube (German Aerospace Center) – SIDs 2013

Real and additional synthetic traffic



additional synthetic traffic **only** visible for the controllers in the trial



Results from SESAR Exercise at Hamburg Airport – Karsten Straube (German Aerospace Center) – SIDs 2013

„Integrated“ Display of Conflicting ATC Clearances Alerts



PHOENIX

surveillance data
processing system



Runway
Controller



SHOWTIME

flight data processing system
including electronic flight strips



Tailor made questionnaires

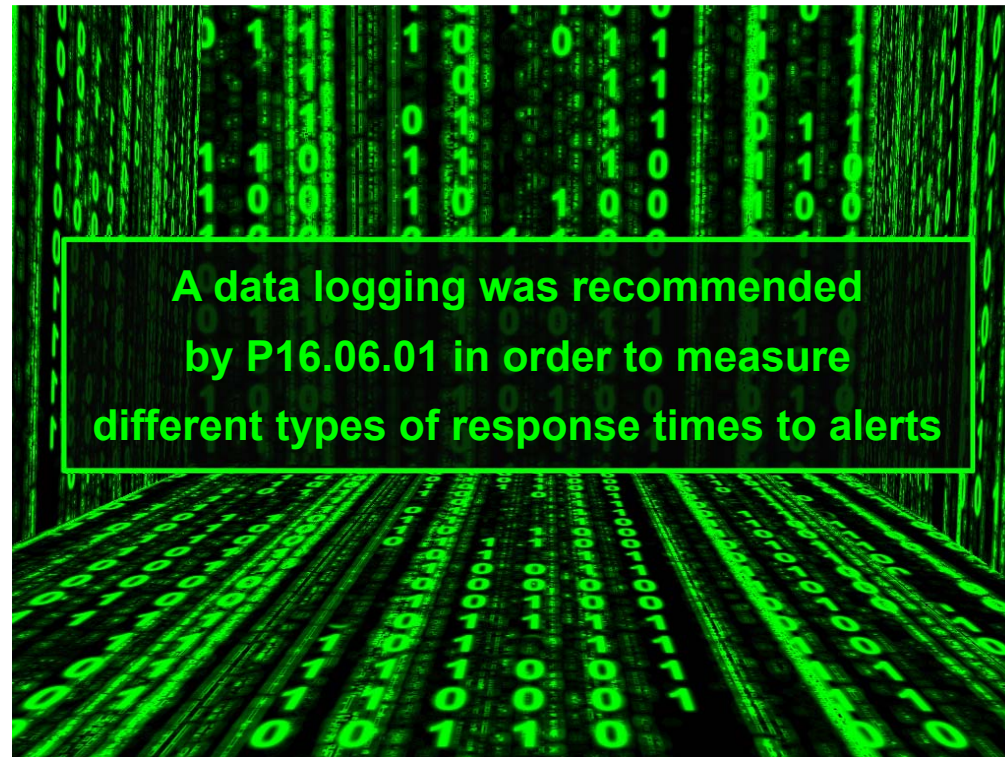




		1	2	3	4	5	6		
ID	Statements	Strongly disagree	Disagree	Slightly disagree	Slightly agree	Agree	Strongly agree	Not important	Not affected
	We continue now with the first clearance being "Line-up".								
	The Conflicting ATC Clearance								
	"Line-Up vs. Land"								
25	when two aircraft receive Line-up and Landing clearances and aircraft receiving the Line-Up clearance is in front of the aircraft	Strongly disagree	Disagree	Slightly disagree	Slightly agree	Agree	Strongly agree	Not important	Not affected
26	when two aircraft receive Line-up and Landing clearances and aircraft receiving clearances are on the opposite ends of the same	Strongly disagree	Disagree	Slightly disagree	Slightly agree	Agree	Strongly agree	Not important	Not affected
	is usable.								
C25a_VP1	(If no, please give proposals how to improve.)								
C25b_VP1	And what characteristics are relevant for an airport like HAM with crossing runways?								



Data Logging



R Results



Detection of conflicting situations

Based on observation control
alert was triggered in each case

Verified by
Data Logging

All controllers emphasized
no alerts were missing

Verified by
Data Logging

multiple alerts with more
aircraft could be displayed

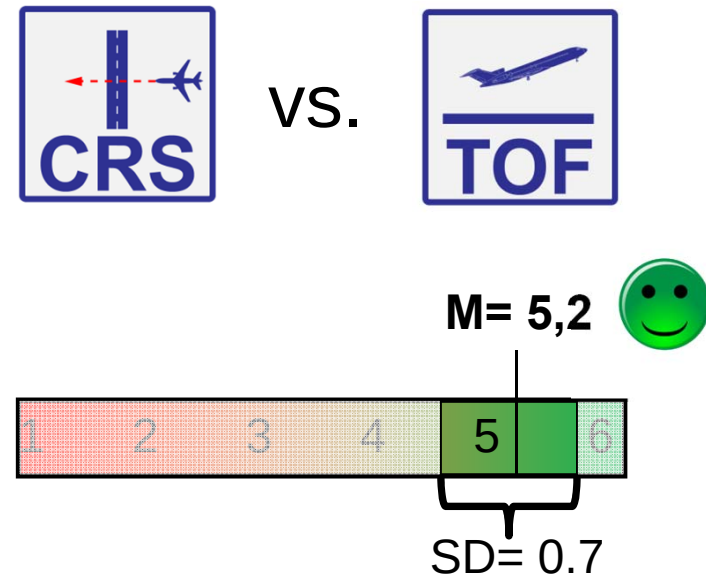
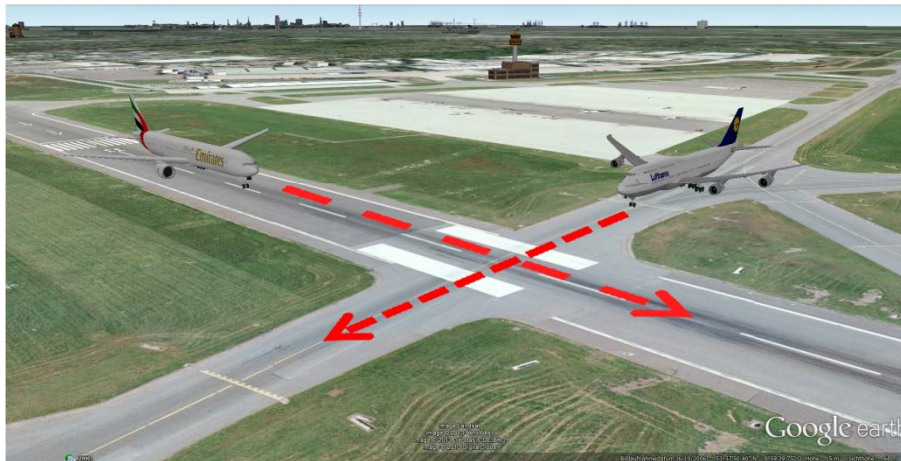
Verified by
Data Logging

	 LND	 LUP	 TOF	 CRS
 LND	55			
 LUP	55	35		
 TOF	96	27	39	
 CRS	25	18	25	4
$\Sigma=379$				



Conflict information appreciated by controllers

Cross vs. Take-off



Validation objective “feasibility”: ATCOs acceptance

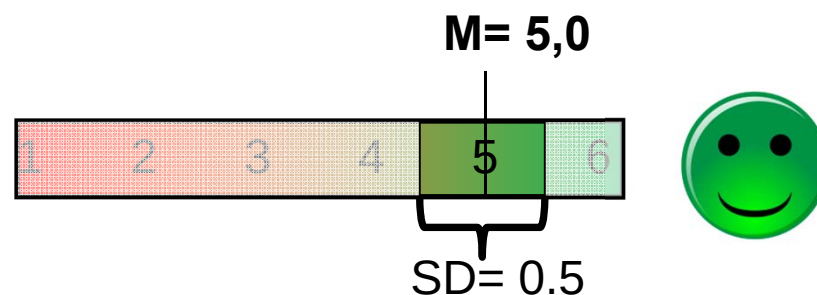
	 LND	 LUP	 TOF	 CRS
 LND	4.9			
 LUP	5.3	5.3		
 TOF	5.1	4.5	4.9	
 CRS	4.7	4.7	5.2	4.8



Validation Objective: Safety – Timely detection of alerts

**Controller's
feedback**

**There was no doubt among the controllers that the alerts are
generally displayed in time**

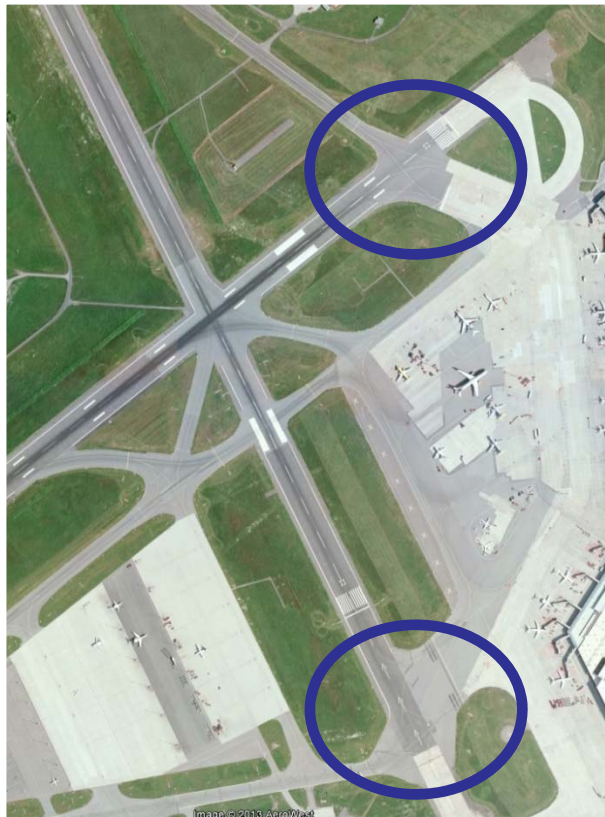


Data Logging

**61,2% of all cases the alert occurred within the same second
38,0% of all cases the alert occurred within two seconds
0,8% of all cases the alert needed more than two seconds**



Validation Objective: Safety – Acceptability of nuisance alert rate



Cross vs. Line up

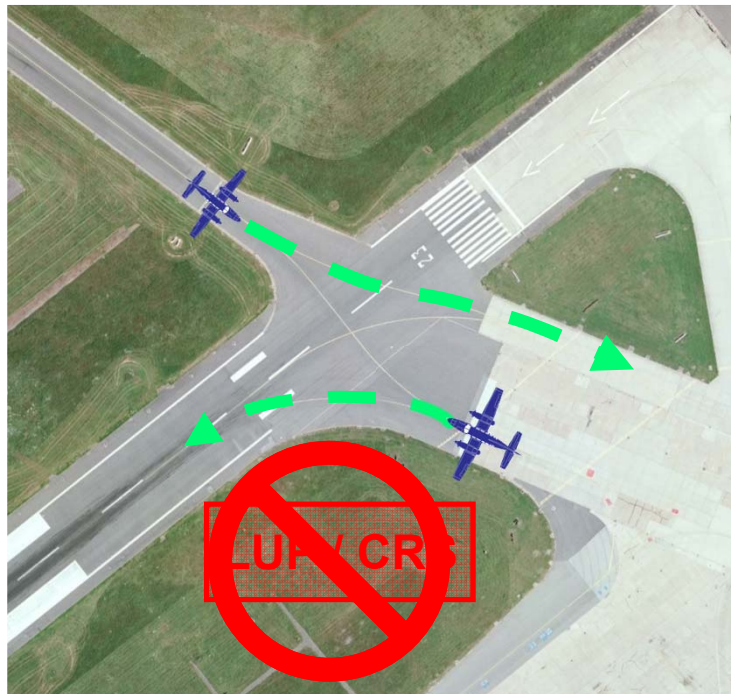
**Crossing D to B East vs.
Line up runway 23 via B West**

**Crossing K to I South vs.
Line up runway 33 via I North**

Depends on aircraft size



Validation Objective: Safety – Acceptability of nuisance alert rate



Cross vs. Line up

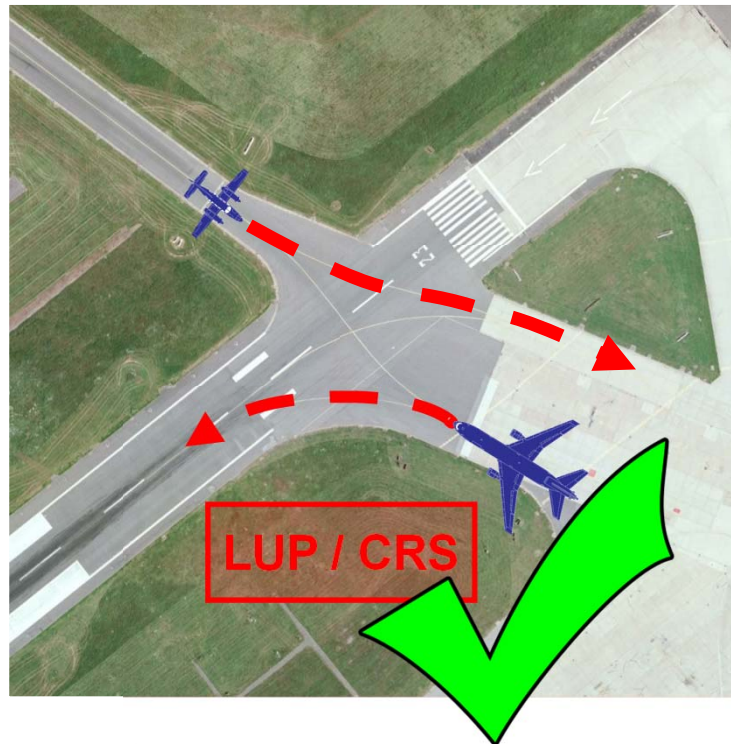
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Validation Objective: Safety – Acceptability of nuisance alert rate



Cross vs. Line up

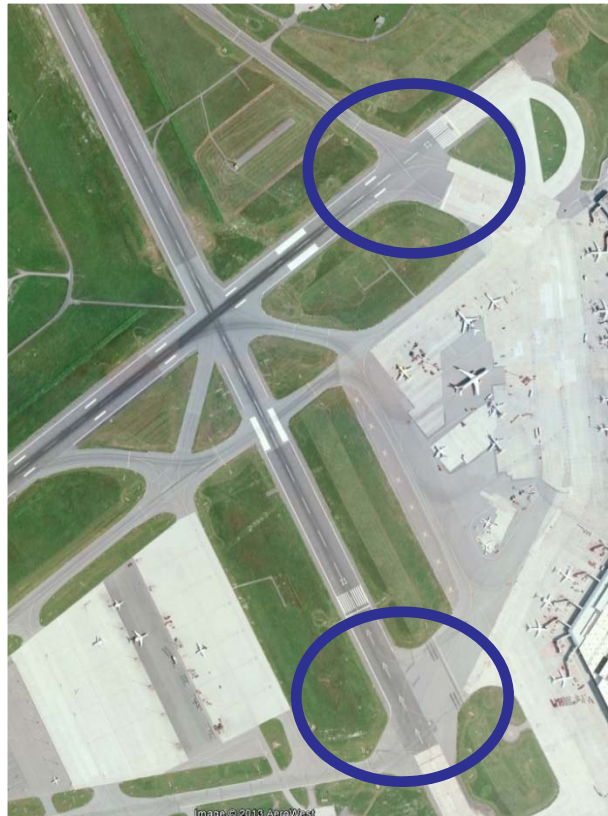
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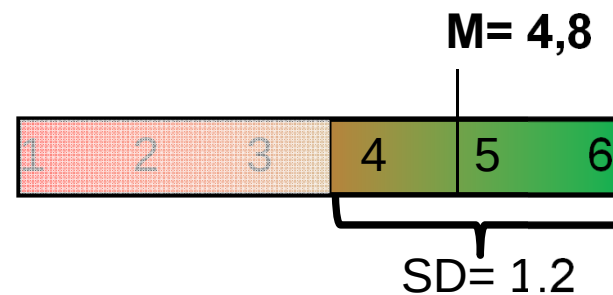


Validation Objective: Safety – Acceptability of nuisance alert rate



Controllers' feedback

ATCOs agreed that the number of nuisance alerts was acceptable



Validation Objectives for Shadow Mode Trials

Feasibility

Fulfillment of operational requirements mainly by controllers' feedback on the usability of the different alerts



Safety

All conflicting situations detected?



Allowing the controller to solve the detected situations timely



False alert rate acceptable for the controller?



Some detections considered as nuisance alerts?



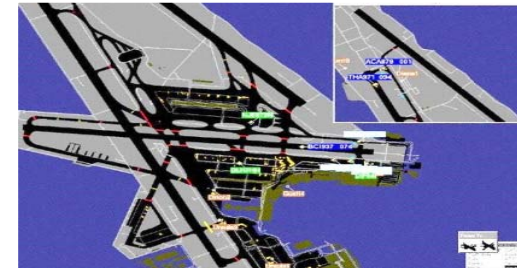
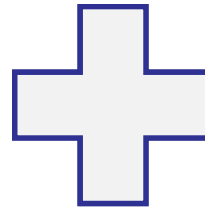
N Next Steps



Next steps

Interaction of the new safety net and the RIMS has to be studied

- priority of alerts has to be identified**
- clarification which type of alert should be triggered at which time**



System should run silently and unattended in shadow mode

Conflicting *taxi clearances* could be tested as well



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THANK YOU

