



# RETINA: Resilient synthetic vision for advanced control tower air navigation service provision

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Founding Members



# RETINA concept

RETINA (Resilient Synthetic Vision for Advanced Control Tower Air Navigation Service Provision) is the concept of enhancing human sight capabilities and situation awareness in the control tower by means of synthetic vision.

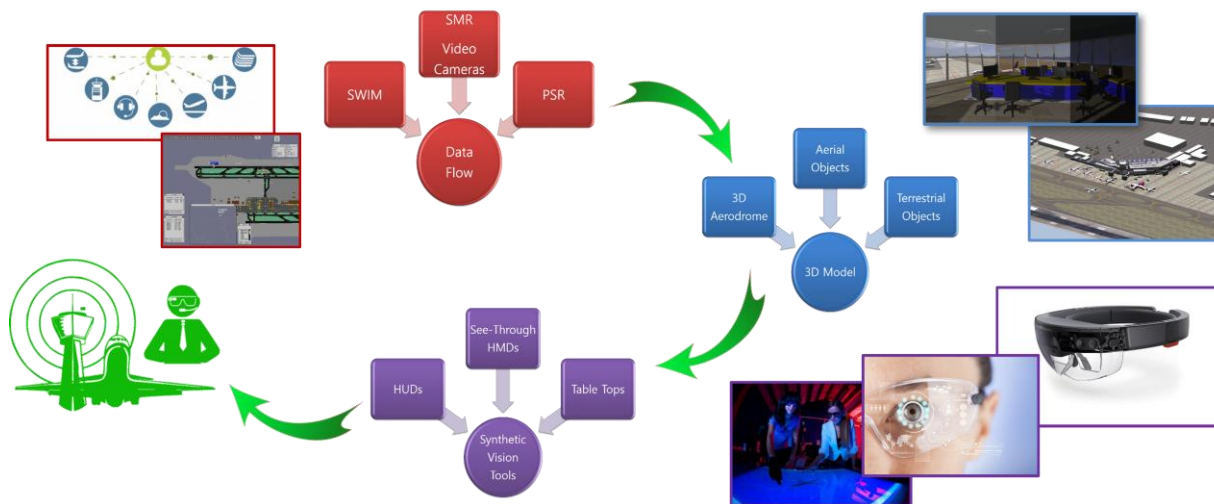


# RETINA concept

In the RETINA concept, controllers will be no longer limited by what the human eye can physically see out of the tower windows.

As trust in digital data will continue to grow, RETINA's concept will allow the controller to have a head-up view of the airport traffic even in low visibility conditions similar to the synthetic vision currently used in the cockpit.

RETINA will build upon the technologies developed in SESAR, such as remote tower, safety nets, SWIM, to provide augmented reality tools for the tower controller.



EXPECTED IMPACTS



# RETINA concept

Out of the Tower View



Overlay

AZ123	A332	H	C	RVR321	B738	M	C
1 NM	318 FT	140 KT		CTOT 12:30			
CLEARED TO LAND				READY			

RETINA concept



# RETINA concept

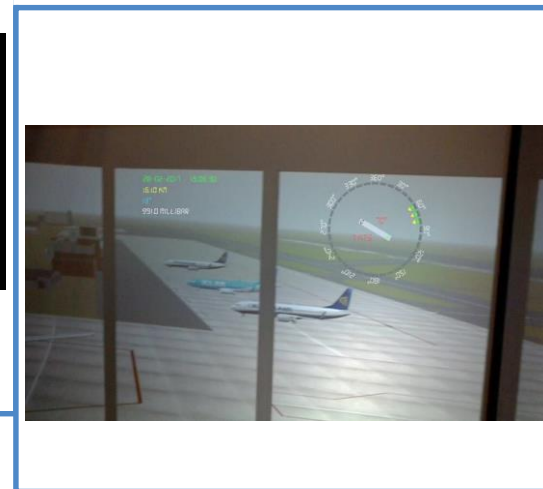
Out of the tower view



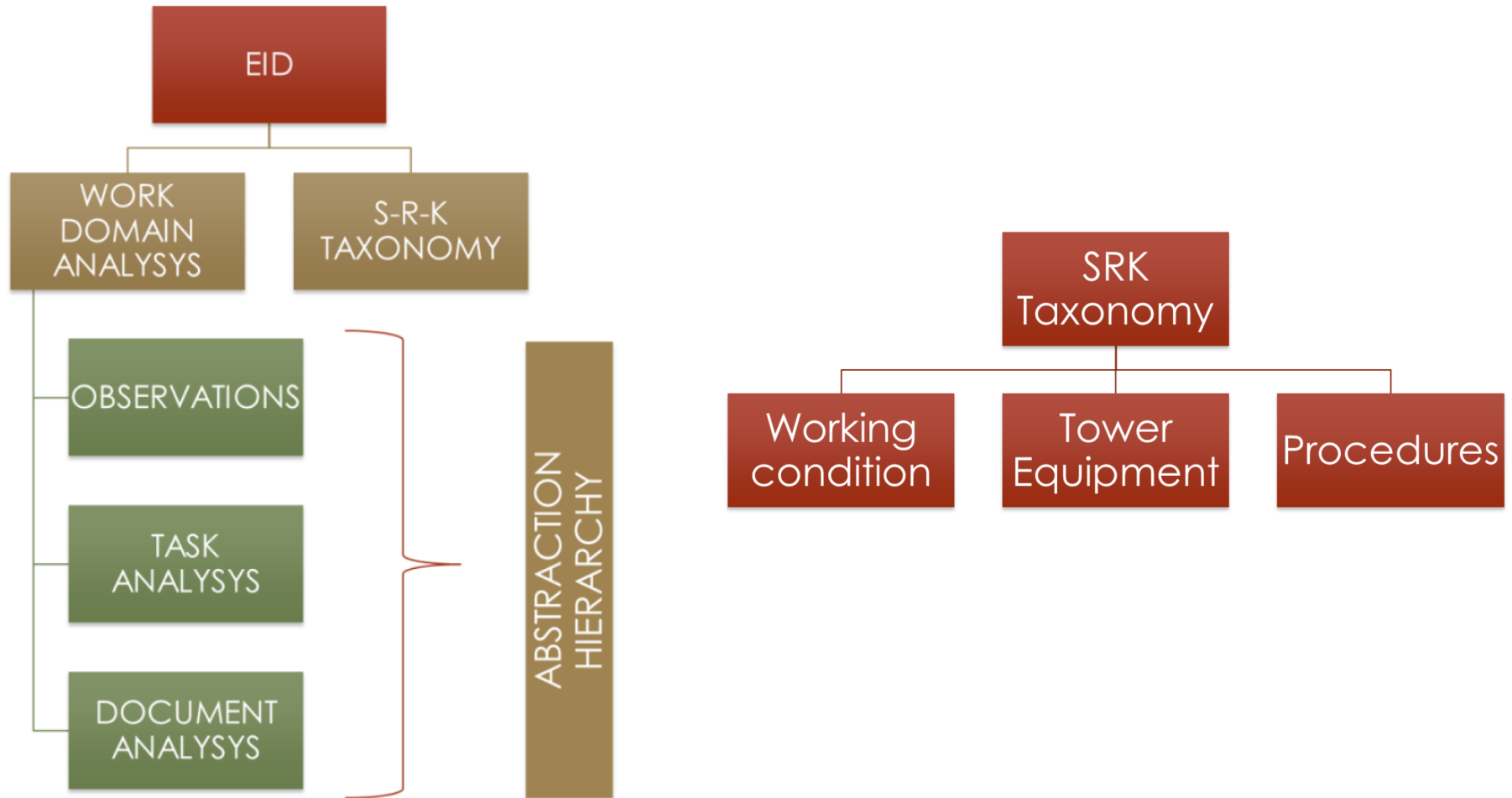
Overlay



RETINA concept



# RETINA and automation: a human factors perspective



# SRK Taxonomy

## Skill

- High Automated processes involving long term memory (procedural)
- Low Executive control (i.e. low attention and working memory)
- No Decision-making (resolution of conflicts and error detection)
- No Problem solving

## Rule

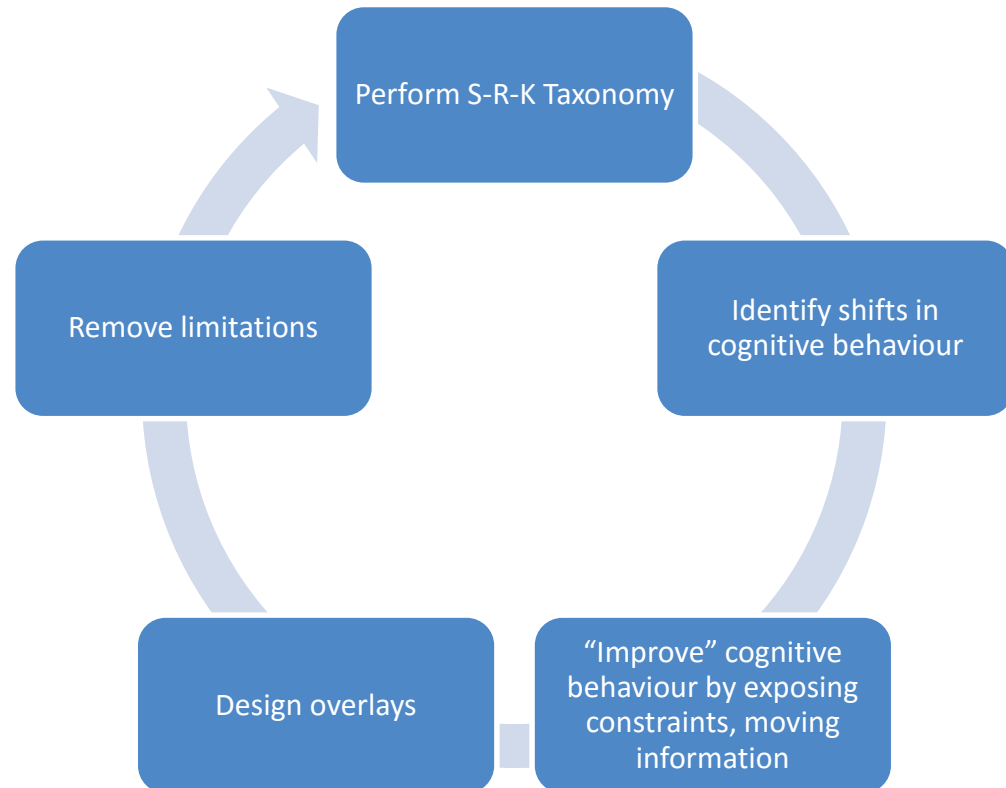
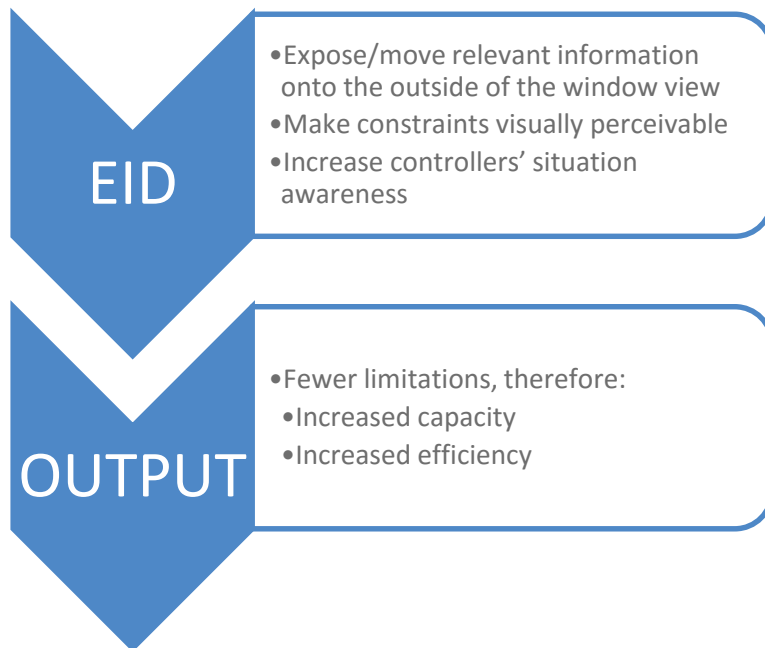
- Less automated processes and long term memory (procedural) than Skill level
- More executive control (i.e. more attention and working memory) than Skill level
- No Decision-making (resolution of conflicts and error detection)
- No Problem solving

## Knowledge

- No automated processes and long term (procedural) memory
- Executive control (high attention and working memory)
- Decision-making (resolution of conflicts and error detection)
- Problem solving

# SRK Taxonomy

- In adverse working conditions (e.g. low visibility) limiting procedures are used in order to “preserve” or “improve” the type of cognitive behaviour.
- More complex cognitive behaviours are moved toward simpler cognitive behaviours, at the expense of throughput and efficiency.





# SRK Taxonomy

	<i>Automation</i>	<i>Executive control</i>	<i>Decision-making</i>	<i>Problem solving</i>
<b>TASK GND 1 – Issue ATC clearance:</b>				
1. Active electronic strip on FDP	high	low	No	No
2. check SID: ATC have to check if SID is congruent to RWY in use and other restrictions (if present)	medium	medium	No	No
3. assign initial level: Local procedure request to assign 5000ft to every flight (rules)	high	low	No	No
4. ATC clearance: Transmit ATC clearance – hear-back – confirmation of the correct receipt of the authorization (standard phraseology)	high	medium	No	No



TASK CODE	TASK DESCRIPTION	S			R			K		
GND 1	ISSUE ATC CLEARANCE									

# SRK Taxonomy: example

## Task GND 4: Issue Taxi Clearance

1. Identify aircraft on apron (SMR)
2. Choose the correct taxiway according to local regulation (rules)
3. Identify taxiway closed or not allowed, choose correct holding point according runway in use (rules) (airport layout, stopbar)
4. Assess aircraft/vehicle conflict already moving (SMR)
5. Choose the best path
6. Transmit taxi clearance (standard phraseology)

### In normal visibility conditions:

TASK CODE	TASK DESCRIPTION	S			R			K		
GND 4	ISSUE TAXI CLEARANCE									

# SRK Taxonomy: example

## Task GND 4: Issue Taxi Clearance

1. Identify aircraft on apron (SMR)
2. Choose the correct taxiway according to local regulation (rules)
3. Identify taxiway closed or not allowed, choose correct holding point according to runway in use (rules) (airport layout, stopbar)
4. Assess aircraft/vehicle conflict already moving (SMR)
5. Choose the best path
6. Transmit taxi clearance (standard phraseology)

### As Visibility decreases:

TASK CODE	TASK DESCRIPTION	S			R			K		
GND 4	ISSUE TAXI CLEARANCE									

# SRK Taxonomy: example

## Task GND 4: Issue Taxi Clearance

1. Identify aircraft on apron (SMR)
2. Choose the correct taxiway according to local regulation (rules)
3. Identify taxiway closed or not allowed, choose correct holding point according runway in use (rules, airport layout, stopbar)
4. Assess aircraft/vehicle conflict already moving (SMR)
5. Choose the best path
6. Transmit taxi clearance (standard phraseology)



### In low visibility conditions:

**The controller cannot see the manoeuvring area**

**Limitations: several taxiways are closed, stopbar CATII/III are activated, follow-me for arriving aircraft, one aircraft moving at one time.**

TASK CODE	TASK DESCRIPTION	S			R			K		
GND 4	ISSUE TAXI CLEARANCE									

# SRK Taxonomy: example

## Task GND 4: Issue Taxi Clearance

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### In low visibility conditions + RETINA equipment:

The controller can see aircraft (“bounding box”) position

The controller can see aerodrome layout, taxiway closed, stop-bar, vehicles

(“follow-me”)

Most limitations can be removed.

TASK CODE	TASK DESCRIPTION	S			R			K		
GND 4	ISSUE TAXI CLEARANCE									



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Thank you very much  
for your attention!



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