



Reducing ATCo's clicking time by factor of 30 by Automatic Speech Recognition

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SESAR 2020 SHOWCASE

#SESARShowcase



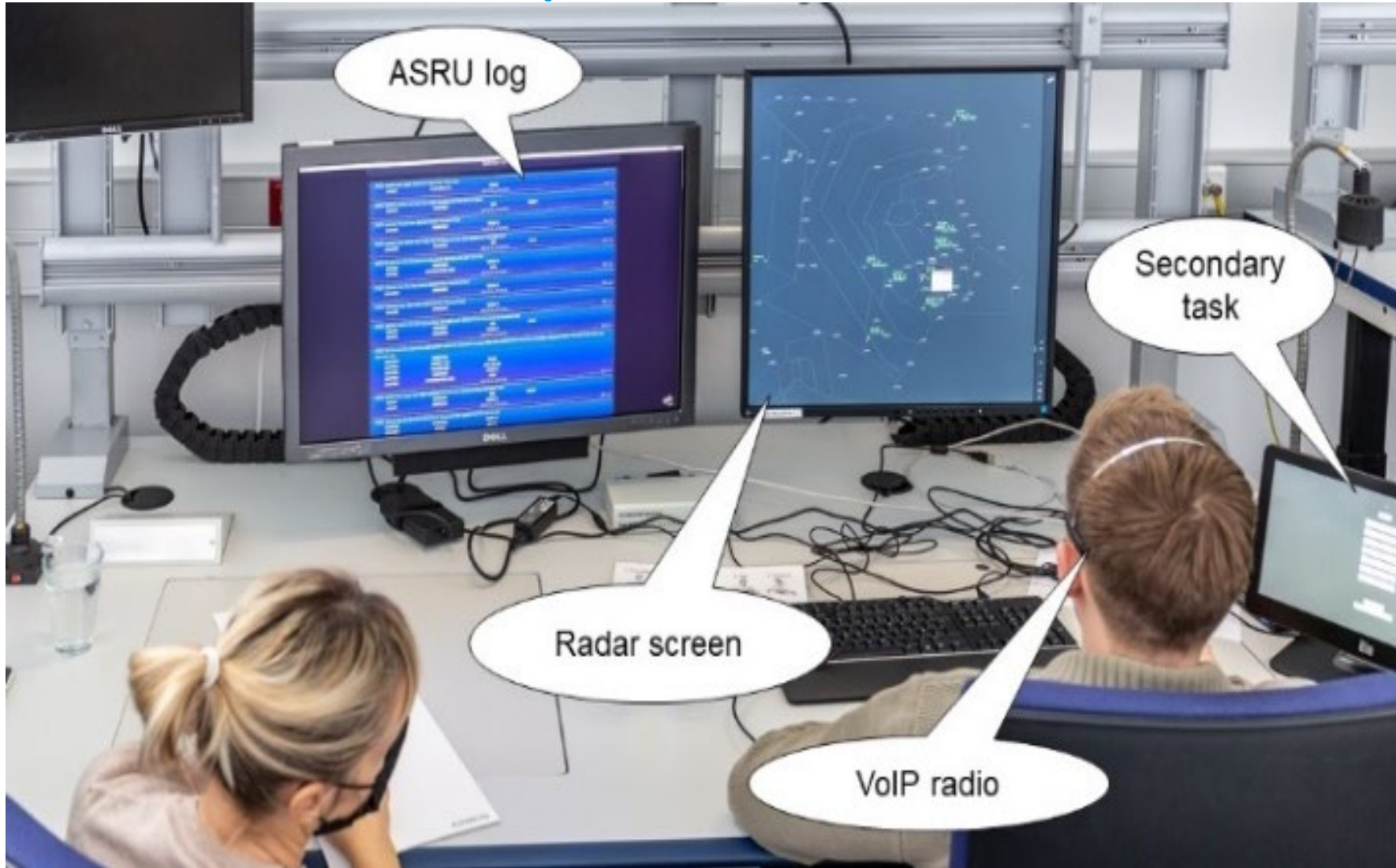
#EuropeForAviation

Pre-Filling Radar Labels with ASRU

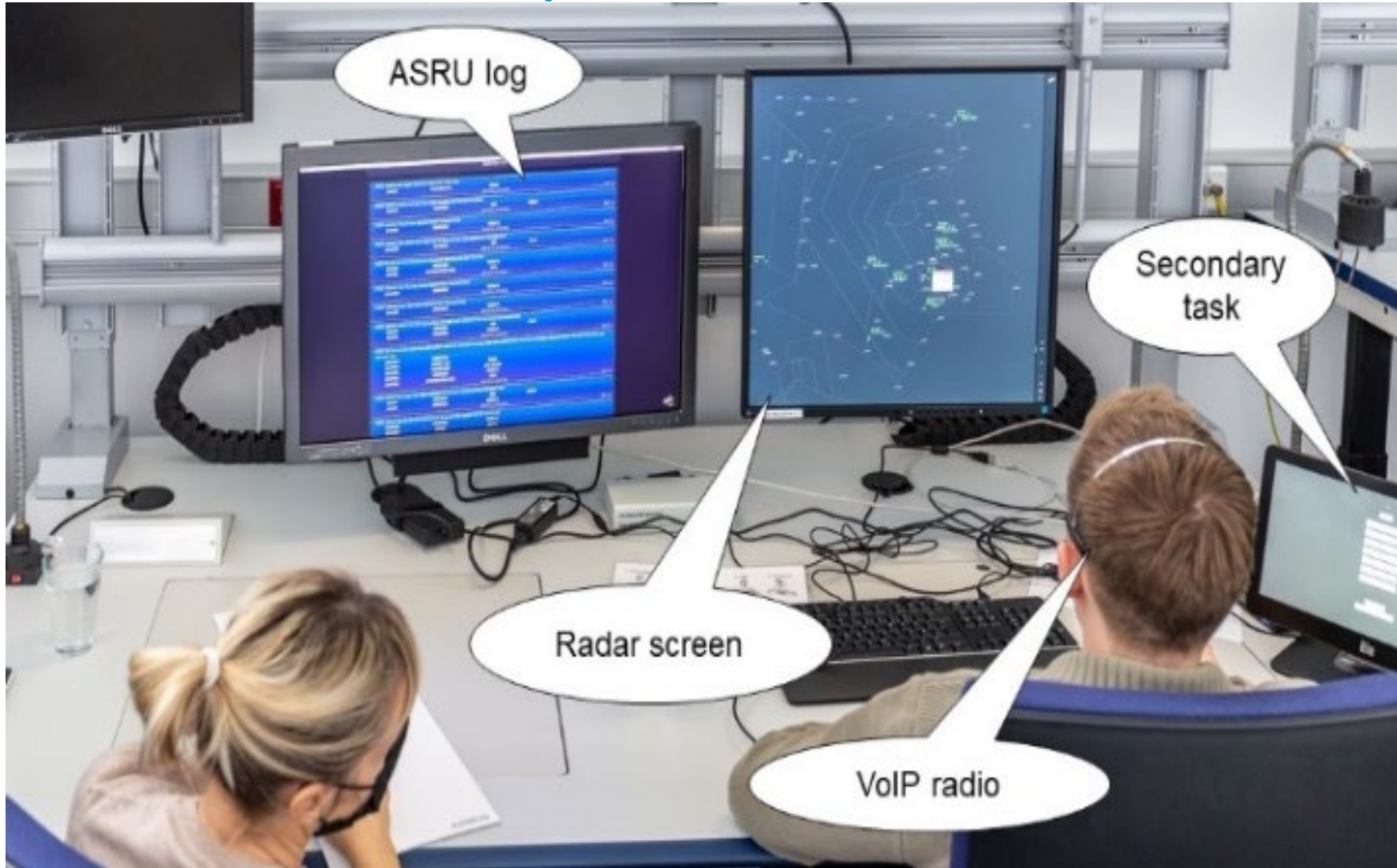


- 12 ATCos
- Vienna Approach
- Baseline: Mouse-input
- Solution: **ASRU** - Automatic Speech Recognition and Understanding

Simulation Setup at DLR



Simulation Setup at DLR



ATCO Input

```
AUA472T ⊗ ✓  
180 120 29 --  
110 --  
091 --- 1000 ↑
```

```
Transition?  
BALAD  
MABOD  
NERDU  
PESAT  
IgnoreMenu
```

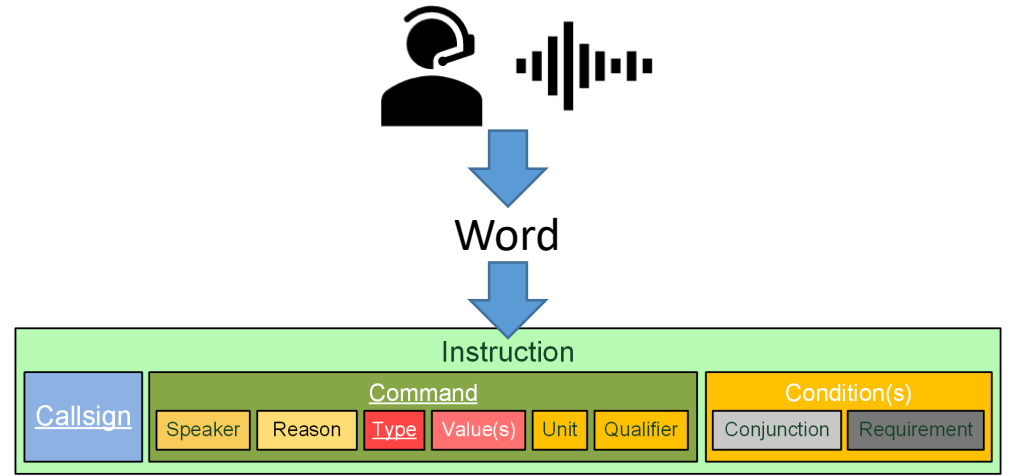
Results

- 28h sim time
- 118,816 spoken words
- 8,844 transmissions
- 17,096 given commands



Results

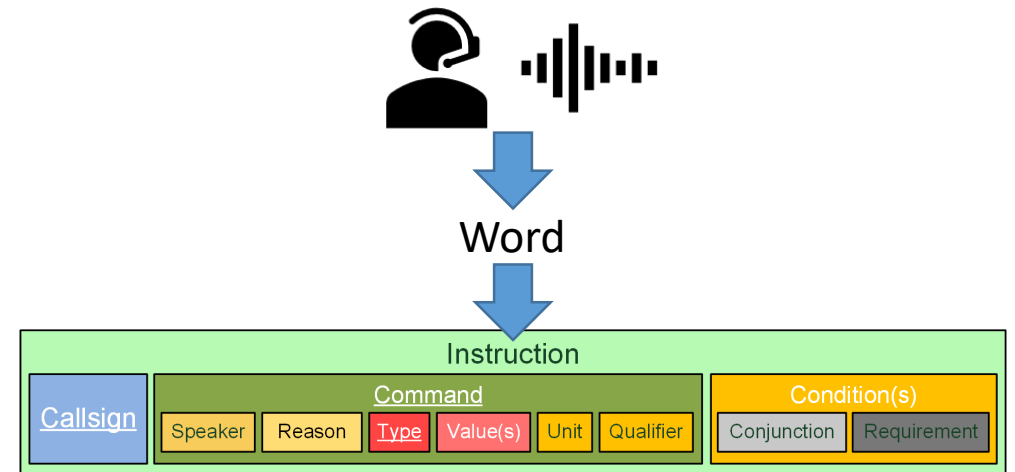
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Results

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- Word error rate 3%
- Command Recognition Rate 92.1%
- Callsign Recognition Rate: 97.8%

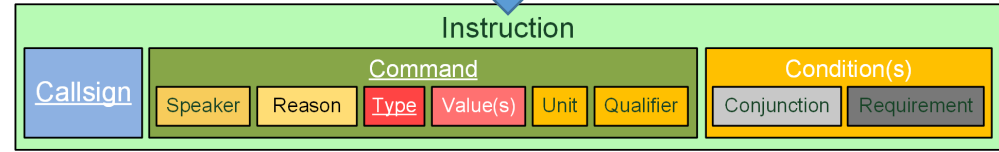


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Word



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- Clicking (Baseline): 12,763 s **with mouse**
- Clicking (Solution): 405 s **with ASRU**

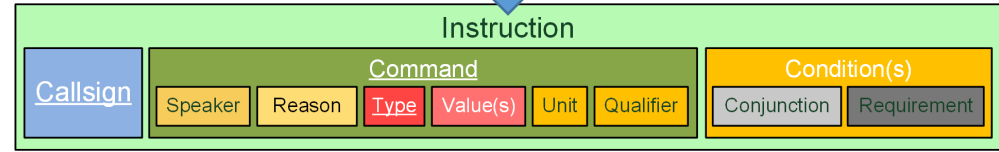


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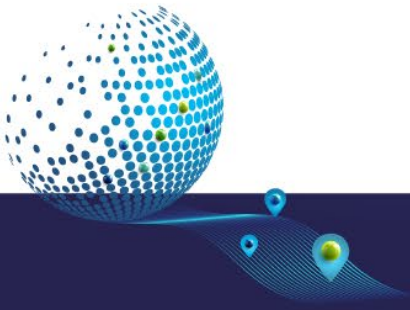


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- Clicking (Baseline): 12,763 s with mouse
- Clicking (Solution): 405 s with ASRU **X 30**



Safety Issues?

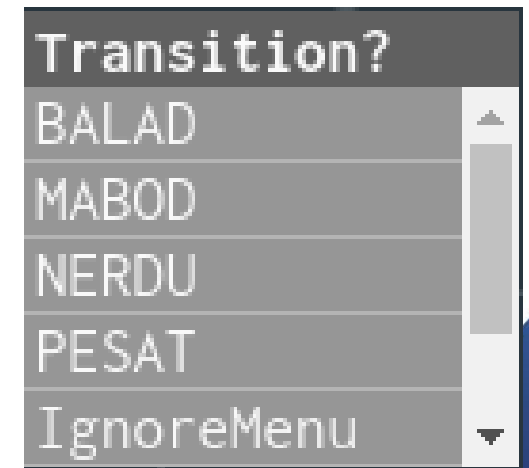
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Safety Issues?

Command Recognition Rate 92.1%

→ 8% need to be manually inserted by ATCo



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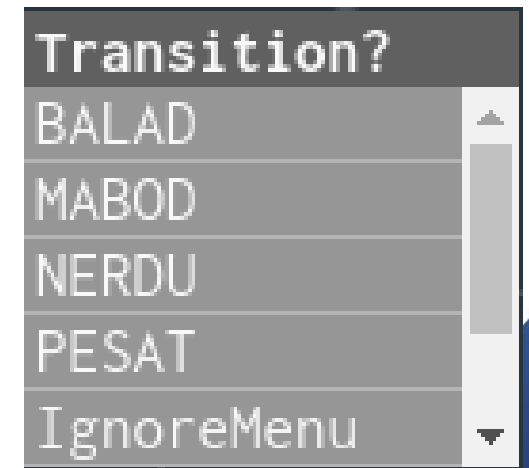
Command Recognition Rate 92.1%

→ 8% need to be manually inserted by ATCo

How many are not corrected by ATCo?

→ 4% are NOT corrected by ATCo.

(We developed special replay software, so that nobody needs to take notes during the trials)



Safety Issues?

4% are NOT corrected by ATCo
with ASRU.

Type	Solution				
	Gold	Clicks	Miss	Add	RR
Alti	1978	28	19	16	95%
Spd	1183	34	17	3	89%
Head	894	7	30	11	94%
WP	604	20	18	25	87%
Tran	289	7	23	1	88%
Rate	64	11	6	1	74%
Spec	1372	19	34	15	92%



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11% are NOT corrected with
mouse only

Type	Baseline				
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Alti	1950	1906	62	20	95%
Spd	1102	1074	70	35	89%
Head	936	572	351	8	94%
WP	598	589	29	14	85%
Tran	301	216	89	12	85%
Rate	63	74	13	4	67%
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➔ Integration with existing assistant systems needed to draw ATCo's attention to possible inconsistencies (e.g. checks with ADS-B downlink)



Next Step: Digital (Co)-Controller



Demo at AT-One Booth

Be an ATCO and test our ASRU...



2022-10-13_15-31-37-40

ATCO: austrian seven five eight juliett
 speed one eight zero knots and contact
 tower one two three decimal eight
 schoenen nachmittag

AUA758J	SPEED	180 kt
AUA758J	CONTACT	TOWER
AUA758J	CONTACT_FREQUENCY	123.600

2022-10-13_15-31-24-74 END | ●

ATCO: austrian two seven two romeo turn
 right heading three two zero cleared ils
 approach three four

AUA272R	HEADING	320	RIGHT
AUA272R	CLEARED	RW34	
	ILS		

2022-10-13_15-30-58-63 END | ●

ATCO: eight six oscar echo yankee
 descend seven thousand feet qnh one
 zero two nine

OEHEY	DESCEND	7000
		ft
OEHEY	INFORMATION	1029
	QNH	

2022-10-13_15-30-48-85 END | ●

ATCO: vueling six six eight six descend
 flight level one four zero

VLG6686 descend flight level one four zero

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AUA758J	SPEED	180 kt
AUA758J	CONTACT	TOWER
AUA758J	CONTACT_FREQUENCY	123.800

2022-10-13_15-31-24-74 END | ●

ATCO: austrian two seven two romeo turn
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VLG6686 descend per information

Demo at AT-One Booth

Be an ATCO and test our ASRU...



...and meet our digital controller

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VLG6686 descend per simulation